GAS JOURNAL

LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

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Editorial Notes.

Gas Undertakings Act, 1929.

REFERENCE will frequently have to be made by readers to the new Act to amend the law with respect to gas undertakings; and to assist in this we reproduce the text of the measure in this issue of the "JOURNAL." Not many weeks have elapsed since the Bill received the Royal Assent; but the Government which was responsible for it has passed into history, where it will be recognized for the things which it did—not the least of them being the granting of this limited charter to a great public service. The reins are now in other hands, but the need of the gas industry remains the same—freedom in every respect to meet its competitors on an equal footing, and to develop its business in the directions affording the greatest promise. As was remarked in these columns a few weeks ago, further legislation—and on a generous scale—must follow if the gas industry is not to have its development dangerously hampered, and to be seriously crippled in the struggle with its competitors. This must be insisted upon.

Meanwhile we have this Act, with the putting in force of the provisions of which the Board of Trade have lost no time. Rules have already been made by them with regard to applications under Section 1, which gives the Board power to make Orders increasing the authorized amount of share capital or of loans. These rules will be found on p. 696 of the "JOURNAL" for June 12; while published in the issue for July 10 were the Rules made for applications for Orders under Section 5 of the Act, relating to the supply of gas to the owner or occupier of premises outside the undertaking's limits of supply. Further than this, there has been notified in our pages the issue of half-a-dozen Orders under Section 6, the object of which is to bring on to the British thermal unit basis of charge undertakings supplying more than 20 million c.ft. of gas per annum.

Loans for Development.

THERE was some debate in the House of Commons last Friday before the second reading of the Development (Loan Guarantees and Grants) Bill, which has been introduced by Mr. J. H. Thomas (Lord Privy Seal) as part of the scheme of the Government for dealing with unemployment. The object of the Bill is to authorize the Treasury to guarantee certain loans to be raised in connection with public utility undertakings, and to authorize the giving of financial assistance in respect of expenditure incurred, or loans raised, for development works. In it, a "public utility undertaking" is defined as "an "undertaking carried on under statutory powers by any "body of persons for providing means of transport or "communication, gas, electricity, water, or power," but does not include any such undertaking which is carried on by a local authority. In connection with commitments that might be made under the measure, Mr. Thomas assured the House that he was being advised by a Committee of public-spirited business men, whose names, when announced, would inspire general confidence.

The Bill gives power to the Treasury to guarantee loans for meeting capital expenditure by a public utility undertaking in Great Britain incurred under a scheme for development, reconstruction, or re-equipment, provided that the aggregate capital amount of the loans does not exceed an amount sufficient to raise the sum of £25,000,000. A guarantee is not to be given unless the Treasury, after consultation with a Committee to be appointed, are satisfied that there is security for the due payment of the interest on, and for the repayment of the principal of, the loan. The Treasury, in considering whether such a guarantee ought to be given, are to have regard to the extent to which the application of the loan is calculated to promote employment in the United Kingdom, and to the probability of the scheme not being proceeded with in the near future if a guarantee in respect of the required loan is not given. Apart from the authority to guarantee loans, the Treasury are to be given power, with the concurrence of the appropriate Government Department, and after consultation with the Committee referred to already, to make grants towards meeting interest charges on development loans.

Local authorities are legislated for by a clause which provides that the Minister of Labour, with the approval of the Treasury and on the recommendation of a Committee appointed by him, may make grants to local authorities, and such bodies as administer undertakings under statutory powers otherwise than for profit, towards any expenditure to be incurred for the purpose of carrying out works of public utility calculated to promote employment in the United Kingdom.

Explosions in the West-End.

UNFORTUNATELY, Dover Street, Piccadilly, was last Friday morning the scene of a series of violent explosions beneath the pavement, causing injury to three persons. We are told that "explosion succeeded explosion for "fifteen or twenty minutes, lifting several manhole-"covers into the air, and so releasing volumes of smoke, "and here and there a tongue of flame." There was naturally a good deal of alarm; and possibly a good many people, seeing on the papers the magic word

"explosion," at once assumed that gas was the cause, and did not trouble to make further investigation. Later in the day, however, the following statement on the cause of the explosion was issued by the Gas Light and Coke Company: "The explosion to-day in Dover Street, "Piccadilly, was not due to coal gas, of which there was "and is no trace, but is believed to be due to bitumen gas "produced by the fusion of an electric cable."

We deeply regret the occurrence, and sympathize with the sufferers; but if the facts are as stated, we do earnestly hope that every effort will be made to acquaint the public with them by those particular writers in the Press who never by any chance lose an opportunity of giving prominence to accidents that may have their origin in the gas distributed by gas undertakings.

Seeing Through a Mist.

This, of course, is very difficult. Aviators find it particularly trying when they are flying over large cities, and it has been said that the country which first eliminates the smoke nuisance will be the one to boast of successful large-scale transportation by air. This aspect of the smoke problem, needless to say, is not the most serious. The health of the community comes first; and only by constantly explaining that living in a mist is good for neither man nor beast shall we be able to rouse public conscience to action. In this respect Mr. W. M. Mason, the Manager of the British Commercial Gas Association, has done, and continues to do, much valuable work. It matters nothing if his address before the annual congress of the Royal Sanitary Institute at Sheffield last week (an extract from which is published in the "Journal" to-day) is not wholly original to our readers, who are converted to the cause of smoke abatement, and who are able correctly to assess the value of the gas industry's contribution. The point is that Mr. Mason is bringing before an important public body some of the methods by which visible and invisible smoke may be eliminated. We use the expression "wholly original" advisedly, the reason being that Mr. Mason invariably adds something new whenever he deals with any topic, irrespective of the number of times he has addressed different audiences on the same subject. At Sheffield, for instance, he mentioned that, if a modest calculation is made that in every home at least two chimneys, on an average, have been effectively and permanently cleaned by the use of gaseous fuel, realization is gained of the practical solution which is being provided by the gas industry. We learn from an interesting paper by Mr. Henry Obermeyer, who is Assistant to the Vice-President of the Consolidated Gas Company of New York, that gas has already saved New York not fewer than 1,750,000 smoking chimneys.

The cost of manufacturing and distributing gas still limits its application for many purposes, though in most of them the cleanliness, efficiency, and convenience of gaseous fuel tend to outweigh its basic cost. And with regard to smoke, the economic balance is well in favour of gas. Our friends across the Atlantic thoroughly enjoy collating statistics; and it has been computed that Chicago could pay over three times its present gas bill, and still not be paying as much as its present gas bill *plus* the cost of the smoke nuisance. Considerations of cost naturally act as a timely reminder that coke, though not such an ideal fuel as gas, is a worthy second; and there is every reason why a more extensive use of graded gas coke in open fireplaces may be expected in the immediate future. Mr. Mason told his audience at Sheffield that one London gas undertaking alone has in force signed contracts to supply regularly 31,000 private domestic consumers with coke graded to suit their special requirements. This is but a beginning of better times for both the gas industry and the public.

Progress is undoubtedly being made in the matter of smoke abatement. A few years ago, for example, the public would not have expressed such strong indignation regarding the scheme for the new power station at Battersea, to which reference has been made on more than one occasion in our columns. Another sign of progress is the interest which municipal authorities are taking in smoke measuring and recording devices. In this regard it is of interest to record that New York is preparing to adopt automatic cameras especially designed to catch offenders against the smoke laws. These cameras take a picture every 30 seconds, and furnish clear photographs at a distance up to 300 ft., working eight hours without recharging or attention. Needless to say, the location of the cameras will not be advertised, but they will be used wherever the city has been unable to convince offenders of their responsibility.

Commercial Low-Temperature Carbonization.

Of late our columns have borne witness to the remarkable activity in the realm of commercial low-temperature carbonization, as distinct from the experimental phase, developments in which we have consistently followed. It is impossible yet to prophesy what is going to be the financial outcome of the various large-scale units which have been brought into operation, but the time is not far distant when a fairly accurate view of the immediate future will be possible, and certainly this year is one full of interest to all those concerned with coal treatment, and will be regarded as of immense importance in low-temperature carbonization circles. The bud, so to speak, has emerged, and we trust that it will withstand successfully the ravages of the green-fly, and that the flower will amply satisfy the anticipations of the low-temperature horticulturists.

So much, of course, depends upon the residuals market; and regarding this, considerable interest attaches to the contention of Dr. W. R. Chapman that any low-temperature process, to be financially successful, should be able to produce lumps of semi-coke from slack coal (the lumps to be strong enough to withstand transport without fracturing or crumbling), a high yield of oil containing a large proportion of constituents of low boiling-point, and a gas of high calorific value. His arguments are set forth in a paper (to be published later in the "Journal") which he read before the Society of Chemical Industry at their annual meeting in Sheffield; and though we are by no means prepared to accept his conclusions without a good deal of qualification, we do share his view that, for industrial purposes, one B.Th.U. is not as good as another. In his paper he describes the Pehrson system of low-temperature carbonization, which produces a gas of 950 B.Th.U. per c.ft., "ideal for enriching purposes."

The reason why we are not prepared to accept Dr. Chapman's conclusions is that we realize that everything depends upon local circumstances, and that several processes producing a gas of low calorific value show signs of marked virility. The Maclaurin plant is an instance selected at random; and during the past month two important commercial low-temperature installations—one producing a rich gas, and the other a gas of *circa* 300 B.Th.U. per c.ft.—have been officially inaugurated. Three weeks ago we published an account of the opening of the first section of "Coalite" plant of Low Temperature Carbonisation, Ltd. (Doncaster Coalite, Ltd.), at Askern. This section, with a throughput of 90,000 tons of coal per annum, and situated at the pithead, was, until Friday last, the largest low-temperature carbonization works officially operating in Great Britain. This claim, however, was not long to stand, for on July 19 the Glenboig plant of the Bussey Coal Distillation Company, Ltd., was opened. A description of the plant, and an account of the ceremony, will be found in later columns of our issue to-day. The former plant makes rich gas, the latter "lean" gas; yet both appear to be correct for the local conditions. We understand that the Askern plant starts in the happy position of having sold in advance its entire output of smokeless fuel from now till next winter, and that the Bussey Company, in addition to having made arrangements for disposing of the oil supplies, intend to sell gas to a brick-making concern in the neighbourhood.

The future of these enterprises will be followed closely both by the "Journal" and by the entire gas industry. Whatever justification there may have been twenty or more years ago for the idea that our industry tended to be hidebound by its adherence to tradition, none can

possibly exist to-day. This applies as much to low-temperature carbonization as to any other question which affects the growth and prosperity of gas. As our readers are aware, five different low-temperature systems are being investigated on a large scale by two London Gas Companies alone. Shortly the whole of the Richmond Works of the Gas Light and Coke Company will be devoted to the production of gas by low-temperature methods. In this regard the remarks of Sir David Milne-Watson, the Governor of the Company, at a recent gathering of the Coal Trade Luncheon Club are significant. "It is," he said, "'rather early yet to say what "the results will be, but it is obvious that the Gas Light "and Coke Company are not going to make a fortune "out of Richmond. It is, however, all to the good that "the gas industry, which is absolutely open-minded on "this question of low-temperature carbonization, should "be taking part in this investigation." There will be universal endorsement of the latter view; and we think there will be general agreement with our opinion that more than ever is it essential for the gas industry to pay the greatest attention to the manufacture and marketing of a first-class solid smokeless fuel suitable for every purpose to which it is applied.

Technical Journals as a Fount of Ideas.

In an address before the Imperial College Chemical Society, Major F. A. Freeth, D.Sc., F.R.S., suggested that in any of the better-class professional journals can be found an astonishing mass of material from which new ideas may be obtained. "Some time ago," he said, "I had staying with me a distinguished man of science who was rather troubled about the difficulty of finding ideas for researches for his students, which had fallen rather hard upon him as he had to direct research in a branch of science in which he was not so specialized himself. I tried the device of hunting through a well-known journal with him, and within an hour he had got hold of at least ten good ideas for new researches." The moral, of course, is obvious.

A Very "Bussey" Day.

Desirous that more than local "colour" should be lent to the official opening of their big new plant at Glenboig, near Glasgow, the Bussey Coal Distillation Company invited a large number of guests to travel with them from London and back for the occasion. But these are strenuous times; many of the guests were extremely busy men; and the problem to be faced was a total run of 800 miles. To public men, a complete day is a lot to sacrifice; and on this occasion no one was called upon to do it. Just over nineteen hours after leaving Euston the party were back there again. From start to finish the whole trip was a revelation of efficiency, on the part both of the Bussey Company and of the L.M.S. Railway. Before ever their installation was put to work, the Bussey Company stamped themselves as an enterprising undertaking; while as for the L.M.S., when one finds so much to cavil at with regard to the attitude of our Railways towards the smaller things of life, it is a matter of pride to see how they rise to the bigger efforts. The new sleeping car train put at the disposal of the party (which ran non-stop to Lanark) was the latest word in luxury; and the day return train fully maintained this high standard of comfort, while increasing the length of the non-stop run, which was from Glenboig to London. This broke the record for all the non-stop railway journeys between Scotland and England, both as regards distance and time. It was 395½ miles without a stop. To further this time-saving scheme, it was arranged that the luncheon and commemorative speeches should be delivered on the train while travelling southwards at 60 miles an hour; and the speeches were broadcasted throughout the saloons. At Glenboig the guests had ample time to see the more important parts of the plant; but opportunity was afforded them to increase their knowledge on the journey home, by the provision of two cinema theatres in the train, in which were exhibited films showing the plant in full detail and from all angles. This train was hauled by one engine, the latest model on the L.M.S. system—truly a triumph of engineering skill, as the whole of the arrangements for the trip were a triumph of organization.

A Further Use for Complete Gasification?

In the "JOURNAL" a short time ago we referred to a paper by Dr. Jacobus G. Aerts, Director of the Private Institute of Technology, Dongon, Holland, contributed to the Second Bituminous Coal Conference held at Pittsburgh. As then stated, the author questions whether the motor fuel which contains the most hydrogen is the best fuel, and whether hydrogenation of coal is necessary to manufacture an ideal motor fuel from coal. He thinks that a more logical way of obtaining motor fuel from coal, than either hydrogenation or low-temperature carbonization, is to produce pure elementary carbon by complete gasification. His idea is to pass carbon dioxide through a bed of glowing coal or coke. The carbon monoxide thereby produced is converted into carbon and carbon dioxide by catalytic aid. The solid product (named "Carbon-alpha" by the author) has a very fine structure; great affinity for oxygen, and therefore a very low combustion temperature (200° C.); great adsorptive capacity; and great lubricating power. Adsorbed substances become free again by a slight rise in temperature. Distillation vapours from coal are readily adsorbed by "Carbonalpha," forming a product which the author describes as "a very precious motor fuel," to which the name "Carbonalphine" has been given. It is stated that this can be used as a motor fuel in a liquid, plastic, or solid form. It can be mixed with heavy oils—say, up to 20 or 30 p.ct.—to form a fuel easy of ignition which will function perfectly in the motor.

How the Coke Market Affects Gas Prices.

An important contribution of statistical research to the problems of gas-works management has been the formulation, by the American Gas Association, of standards of operation and performance which facilitate comparison of an individual concern within the industry with the progress of the industry as a whole. In 1928 an analysis was made of 135 representative undertakings. This analysis covered the financial, operating, and commercial phases, as well as the production, utilization, and sales of bye-products. It is stated in the Report of the Committee on Economic and Engineering Survey of the Gas Industry, who were responsible for the work, that those undertakings which possess coal gas plants have high earning power when these plants are operated practically at full capacity throughout the year, leaving the water gas plants to account for 15 to 20 p.ct. of their capacity. On the other hand, when the coal gas plants average only about 75 p.ct. of their capacity, and the water gas plants operate at 30 to 40 p.ct. capacity, the earning power is considerably lower. The conclusion arrived at is that, for companies equipped with coal gas plant, the development or lack of development of the coke market is one of the most important determining factors as to whether plants can be operated under conditions of greatest over-all economy. In many instances it appeared that undertakings with undeveloped coke markets have a large percentage of the total make of gas consisting of water gas, while the coal gas plants are working below capacity. In other words, it is the inability to sell the additional coke which would otherwise be produced which is the root cause of the comparatively low earning power. The undertakings in the higher earning groups are selling on an average two or more tons of coke annually per domestic meter. About 80 p.ct. of their total make is coal gas, and the coal gas plant is working at full capacity. On the other hand, the concerns in the lower earning group are selling less than one ton of coke annually per domestic meter, and consequently a large percentage of their total make of gas is water gas, with the coal gas units operating considerably below capacity.

FORTHCOMING ENGAGEMENTS.

July 31.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

Aug. 13-14.—IRISH ASSOCIATION OF GAS MANAGERS.—Meeting in Dublin.

Sept. 12.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting at St. Andrews.

Sept. 19.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.—General Meeting at Porthcawl.

Oct. 28-30.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual Conference at Eastbourne.

PERSONAL.

MANCHESTER'S CHIEF GAS ENGINEER.

The Gas Committee of the Manchester Corporation have recommended the appointment of Mr. A. L. Holton, Manager of the Bradford Road Gas-Works, to be Chief Gas Engineer at a salary of £1750. It will be recalled that, after the publication of the report of the Government Inspector who conducted the inquiry held after the explosion at the Bradford Road Works, and who recommended that a responsible engineer should be immediately appointed, the position was advertised at a salary of £1500. The applications being considered unsatisfactory, it was then decided to increase the salary to £2250 a year. The Committee finally reported to the Council that as a result of this advertisement there was no one in the short list of applicants—with the exception of one applicant who withdrew his name—that had been prepared who had not been willing to accept the post at the lower salary. In these circumstances the Council allowed the Committee to exercise their discretion on the question of salary.

The applicant who withdrew was Mr. H. Dumbleton, of Dublin; and the Alliance and Dublin Consumers' Gas Company have retained his services. In 1914, Mr. Dumbleton left the Manchester Corporation Gas Undertaking to assist Mr. William Newbigging, M.Inst.C.E., in his investigations into the working of the Dublin concern; and on the re-organization of the Dublin staff he was appointed to his present position of Chief Engineer.

Mr. Alfred L. Holton entered the service of the Sheffield United Gas Light Company, at their bye-product works, Grimesthorpe, in 1891, under Mr. Fletcher Stevenson, M.Inst.C.E., and during his services at these works Mr. Stevenson designed and erected a complete gas-works of 5 million c.ft. capacity. Mr. Holton subsequently served as Process Chemist at the Neepsend and Effingham Gas-Works.

In 1902, he entered the service of the Manchester Corporation as Chemist-in-Charge of their bye-product plant, and in 1914 was appointed Works Superintendent of the Bradford Road Gas and Bye-Product Works, where, in 1922, he was appointed Manager. The Bradford Road Works are capable of producing 16 million c.ft. per day of coal gas and 6 millions per day of carburetted water gas; and the bye-product plant yields 5000 tons of sulphate of ammonia, and 4000 tons of B.O.V. per annum. In 1927, the Gaythorn Works were also placed under his management.

Mr. Holton is a member of the British Association of Chemists, the Society of Chemical Industry, and the Institution of Gas Engineers. He is a Past Secretary and President of the Manchester and District Junior Gas Association; and during his period of Secretaryship there was organized the first joint visit with the Yorkshire Association, and afterwards the Joint Council of the English Junior Gas Associations.

OBITUARY.

MR. JOHN WILSON.

An Appreciation by Mr. FRANKLIN THORP.

By the death of Mr. John Wilson, of London, who had been in the employment of Messrs. W. & B. Cowan for 44 years as Chief Draughtsman and Technical Engineer, the Company has lost a worker whose knowledge of gas meters was profound. It was my privilege to work with Mr. Wilson for the past ten years, and I was much impressed by his sound judgment on all questions arising on the theory and manufacture of apparatus for gas measurement.

Having been closely connected with the late Mr. William Cowan for many years, and later with Sir Henry Cowan, Chairman of Parkinson & Cowan, Ltd., Mr. Wilson had unique opportunity of looking into all matters appertaining to the governing and measurement of gas; and there are many engineers who will have pleasant recollections of meeting Mr. Wilson and hearing his views on various matters.

I cannot let this occasion pass without expressing my own admiration for his great qualities and for the help he has given me during the years we have worked together. It is not often that we find a man with his abilities of so retiring a nature. He never forced his opinions upon anyone, but always gave a reason for any views that he expressed.

The gas industry in general will know him principally through his patent "Reel Valve" retort house governor, and those who had the privilege of meeting him will remember him for his many good qualities.

He came of a family well known in the gas engineering world, and it is only recently that the "JOURNAL" recorded the death of his brother, Mr. Alexander Wilson, late Engineer of the Glasgow Corporation Gas-Works.

The death is announced of ALBERT CHARLES JONES, Principal of Messenger & Sons, Broad Street, Birmingham, who died on Saturday last, after a long illness, at his residence, Rouncill Towers, Kenilworth, aged seventy-eight. For the past sixty years he was closely identified with the firm of Messenger, the pioneers of the gas fittings trade, and in more recent years manufacturers of oil lamps and electric light fittings, of which business he was proprietor for the past forty-five years.

ON THE ELECTRICAL SIDE.

Peterborough's New Power Station.

Among several points of interest in connection with the recently opened generating station of the Peterborough Corporation is the fact that it is believed to be the only wholly public supply undertaking in this country which is entirely fired by pulverized fuel, without an alternative source of supply to the distribution system. For some time pulverized fuel was used in the old station; and in the conditions then existing its advantages were clearly demonstrated in increased efficiency, ability to use lower grades of fuel, and greatly increased evaporative capacity. Therefore it was decided to continue its use in the new station. So far as is known, the station is the only one in the world in which there is no storage of coal in any form in the boiler-house building. This new Peterborough station will hold a key position for an extensive East-Midland area; arrangements having been made for it to feed into the "grid" nearby.

Co-Operative Research.

After eight years of important and increasing work, the British Electrical and Allied Industries Research Association find themselves in urgent need of help on a more liberal scale than hitherto. The main objects of the Association are: To investigate matters affecting the proper utilization of plant, apparatus, and materials, with a view to greater reliability in operation and extension of useful life of such plant, leading to a reduction in the cost of electricity; and to investigate materials and methods used in the manufacture of electrical plant and apparatus, to develop improved and simplified methods of test for ensuring that materials reach a proper standard, and to secure the establishment of standards for performance which can be relied on by the manufacturers and users of plant and apparatus. The organization was originally founded under the scheme of Research Associations developed by the Department of Scientific and Industrial Research, and has received from the Government financial support. This support has, however, in accordance with the approved policy for Research Associations, been on a diminishing scale, and, under the present scheme, terminates next year. This is the reason for an appeal which is now being made to the manufacturers, the authorized undertakers throughout the country, both local authority and company, and consumers of electricity to take their part in the effort to obtain further financial support.

A Comparison.

In this connection, a passage may be quoted from the recent Presidential Address of Mr. A. Nichols Moore to the Incorporated Municipal Electrical Association.

Before referring to the British Electrical and Allied Industries Research Association, he said: "Possibly none of the allied associations is of greater importance to the future of the electricity supply industry than the British Electrical Development Association. Its position is the counterpart of that of the British Commercial Gas Association; but, unlike the latter Association, it can only raise for publicity and propaganda, in an industry which on the supply side alone represents a subscribed capital of some £350,000,000, the comparatively paltry sum of £40,000 per annum, and until it is at least as fully established and as financially strong as the latter Association it will be unable to fulfil its essential purpose. May I urge those municipal electricity supply authorities who have so far declined to become subscribing members to reconsider their decision and give the Association their active support without delay?" The "sister industry" always has an eye upon the prominent position of the "B.C.G.A." and its efficient working.

"Atrocious" Electric Fires.

The expression is not ours; but we have the courage to express a certain amount of agreement with it. An official visit was paid by members of the Electrical Association for Women to the North-East Coast Exhibition at Newcastle; and there was a discussion on "The Modern Development of Electricity as it Affects Women." Thus says an electrical contemporary: Strong criticism of the ugliness of electric fires was made by Lady Brooks, of Birmingham. She complained of the "horrible stuff being turned out by the electrical people. I think electric fires are atrocities," she declared, "instead of being things of beauty which one feels one ought to have."

MR. WALTER HOLE'S WORK FOR THE EDUCATION SCHEME.

As was announced at the Annual Meeting of the Institution last June, Mr. Walter Hole is retiring from the post of Organizing Secretary of the Education Scheme—a position which, to quote from the Education Committee's Report, "he has filled from its inception with ability, energy, and enthusiasm beyond all praise." It is good to know, however, that he is to continue to serve the Committee as a member.

The pioneer work of the Committee has been rewarded by a gratifying growth in the number of those preparing for the examinations, from 56 in 1924 to 347 in 1929. Since Mr. Hole took over his duties, the Minor Grouped Courses and the Gas Fitting Course have been added to the Institution's original Major Course schemes, and last year no fewer than 930 candidates entered for examination under these courses, making, with the 347 Major Course candidates, a total of 1277 employees in the industry who came under the influence of the scheme in one way or other. Even this is an under-statement, as it takes no account of those undergoing tuition in the years prior to the year of the final examination; but what these numbers are we have no means of ascertaining.

Naturally, all this growth has involved a tremendous amount of detail in many ways—far too much to be dealt with, as Mr. Hole remarks, by one "on the shelf." Further, when he took up the task, he determined, subject to continuance of health, to give five years to setting the Scheme on its feet. Last year, therefore, he asked the Committee to allow him to relinquish the post; but at their earnest desire, owing to the pending change in the Secretaryship of the Institution, he decided to carry on for another year. He therefore really went out of office at the end of June, but has since, at Mr. Campbell's request, dealt with the results of the external examinations, which it would not have been easy to take over half completed.

It has, Mr. Hole tell us, been a very happy seven years' spell of service; and perhaps one of the things which has gratified him most in giving up the office has been the large number of letters he has received from the Heads of Technical Colleges all over the country, as well as from many gas engineers in the United Kingdom, speaking in very appreciative terms of his work in this direction.

It is fitting that we should here record in brief the development of the Education Scheme. The year 1918 saw the birth of the idea, when the Institution was approached on behalf of the Junior Gas Associations through Mr. J. G. Clark, Secretary of the Joint Committee of the Junior Gas Associations, who offered to submit a scheme for the better education of those entering the ranks of the industry. A Committee was appointed to discuss the matter with the Juniors, consisting of Messrs. A. E. Broadberry, S. Glover, F. W. Goodenough, C.B.E., T. Goulden, and T. Hardie.

In May of 1919 the "Committee for the Technical Education in the Gas Industry" was appointed, consisting of Sir Dugald Clerk, and Messrs. Broadberry, S. Glover, Goodenough, Goulden, Hardie, Walter Hole, H. Kendrick, W. E. Price, and Clark. This Committee later in the same year appointed a Sub-Committee consisting of Messrs. Goulden, Clark, S. Glover, Hole, and Kendrick, further to explore the ground and formulate a scheme.

In 1920, as a result of certain suggestions made in the course of discussion, at the March meeting Messrs. T. Glover and Walter Hole were invited by the Committee to prepare separately schemes based on the suggestions then made. These were considered at a later meeting. It was found that Mr. Hole had elaborated a scheme dealing with Ordinary, Higher, and Diploma stages in both Gas Engineering and Gas Supply, with a co-ordinated course of studies in suitable ancillary subjects; and this was accepted as a basis, and referred to Mr. Goodenough and Mr. Hole to elaborate details. The assistance of the Board of Education was at this stage invaluable—the Institution members having defined what was desired—in dealing with the ancillary subjects and evolving the best means of eliciting the co-operation of the technical colleges of the country in the working of the scheme.

By August, 1920, the Draft Scheme had been worked out, adopted, and recommended to the Council of the Institution for adoption. After discussion, the Council felt that, before accepting and adopting the Scheme, it would be well to submit it to the District Associations and also to the Junior Associations for comment and criticism; and Mr. Hole, who by then had retired from active service at Leeds, was asked to attend these district meetings for the purpose of explaining the Scheme and dealing with questions or criticisms. This necessary spade-work took a good deal of time, but eventually the Scheme was submitted to a special meeting of the Institution in February, 1923, and cordially adopted. Mr. Walter Hole was shortly after appointed Organizing Secretary for the Scheme.

As was to be expected in a new venture of this kind, experience revealed weak places in the Scheme, and the Committee has shown itself throughout quite ready to remedy all such. Accordingly, in 1925, and again in 1927, the Scheme was revised in minor details, and the section dealing with the external and isolated student is now again (1929) undergoing modification. It is, however, a tribute to the skill and soundness with which the original Scheme was devised that it has never been necessary to alter its structure or foundation principles.

GAS STOCK AND SHARE MARKET.

[For Stock and Share List, see later page.]

CONDITIONS on the Stock Exchange were distinctly subdued throughout the whole of last week. The further loss of gold by the Bank of England caused increasing uneasiness regarding the Bank Rate, and the previous week's recovery in investment stocks speedily disappeared. The Industrial Market was no exception to the general rule; and it was thought that the Account which came to a conclusion on Friday was one of the most unsatisfactory of the year.

There was nothing doing in the Gas Market. A few parcels of stock came into the market, including Uxbridge 5 p.c. and Hastings 3½ p.c. These stocks usually are absorbed quickly; but there seemed to be no buyers, and they were eventually disposed of privately. The former stock is very attractive, and at the present average price of 95½ yields, on the last half-yearly dividend, £7 6s. 7d. p.c. Information from the various companies indicates that they have had a very successful half-year. Dividends will be maintained, and in some cases possibly be increased.

The following transactions were recorded during the week:

MONDAY.—Bournemouth 6 p.c. pref. 11⅛, British 7 p.c. pref. 115, Gas Light and Coke 19s., 19s. 1½d., 19s. 3d., 19s. 4½d., 19s. 6d., 3½ p.c. max. 63½, 4 p.c. pref. 76½, 77¼, 77½, 5 p.c. deb. 99¾, Imperial Continental 380, 381, 382, 383, 385, 388, 3½ p.c. deb. 72, Primitiva 36s., 36s. 3d., 36s. 6d., 36s. 9d., 37s., 37s. 3d., 37s. 6d., Southampton 5 p.c. max. 79, Tottenham 3½ p.c. 107, 107½, 108. Supplementary prices, Gas Light and Coke 7½ p.c. Brentford bonds 101¾.

TUESDAY.—Alliance and Dublin 96, 96¼, Bombay 19s., British 118, 5 p.c. deb. 96¼, 96½, Gas Light and Coke 19s. 3d., 19s. 4½d., 4 p.c. pref. 76½, 5 p.c. deb. 99, 99¾, Imperial Continental 377, 380, 383, Plymouth and Stonehouse 112, Portsmouth 4 p.c. 115, 116, 5 p.c. max. 83, 83½, Primitiva 36s. 6d., 36s. 9d., 37s., 37s. 3d., 37s. 6d., South Metropolitan 6 p.c. pref. 109½, 3 p.c. deb. 57½. Supplementary prices, Grays and Tilbury 4 p.c. deb. 75¾, Yorktown (Camberley) new 5 p.c. pref. 93.

WEDNESDAY.—Bombay 19s., Commercial 99, Gas Light and Coke 19s. 2¼d., 19s. 3d., 19s. 5¼d., 3½ p.c. 63½, 3 p.c. deb. 59, Hong Kong and China 14½, 14¾, Hornsey 3½ p.c. 87, 88, Imperial Continental 375, 377, 380, 382, Oriental 118, 119½, Plymouth and Stonehouse 5 p.c. 113, Primitiva 36s. 3d., 37s., 37s. 6d., South Metropolitan 6 p.c. pref. 109, 110, Tottenham 3½ p.c. 107. Supplementary prices, Brighton and Hove 6 p.c. pref. 106, 107, Hornsey 5 p.c. 103, 105, Southgate 5 p.c. pref. 85, 86, Uxbridge, Maidenhead 4 p.c. deb. 72.

THURSDAY.—Aldershot 4 p.c. pref. 76, European 16¾, Gas Light and Coke 19s. 1½d., 19s. 3d., 19s. 4½d., 19s. 6d., 3½ p.c. max. 64, 3 p.c. deb. 58⅛, 5 p.c. deb. 99½, Imperial Continental 375, 377, 378, 379, 380, Primitiva 36s. 3d., 36s. 9d., 37s. 6d., 4 p.c. con. deb. 80, South Metropolitan 104, 104¼, 3 p.c. deb. 58½. Supplementary prices, Associated Gas and Electric $62, Brighton and Hove 6 p.c. pref. 106¾, Montevideo new 21s. 6d., Tottenham 5 p.c. pref. 87½, Yorktown new 5 p.c. pref. 93.

FRIDAY.—British 118, 119, Cape Town 9½, Commercial 97½, European 17¼, 17¾, Gas Light and Coke 19s., 19s. 3d., 19s. 4½d., 3½ p.c. 63½, 63¾, 4 p.c. pref. 77½, Imperial Continental 375, 376, 377½, 378, 380, Primitiva 36s., 36s. 9d., 37s. 3d., South Metropolitan 103¾, 104, 104½, 104⅝, Tottenham 3½ p.c. 107, 4 p.c. deb. 75½. Supplementary prices, Reading 5 p.c. 82¾, Yorktown new 5 p.c. pref. 93.

The loss of gold to both Germany and France brought about a rise in discount rates, and the average at which Treasury Bills were allotted—£5 8s. 0·37d. p.c., being 1s. 10·52d. above the previous week's rate—showed the feelings of the market.

The Bank Rate is 5½ p.c., to which it was raised from 4½ p.c. on Feb. 7. The Banks' deposit rate is 3½ p.c., and the deposit rates of the Discount Houses are 3½ p.c. at call and 3¾ p.c. at notice.

POTENTIAL INVESTMENTS.

XXI.—Maidstone Gas Company.

The Maidstone Gas Company was formed in the year 1823, and Incorporated by Special Act of Parliament in the same year. Subsequent Acts and Orders were obtained in 1858, 1880, 1896, 1903, 1907, and 1921. The Head Office is in St. Peter Street, Maidstone, Kent. The statutory area of supply covers 82 square miles, and, in addition to the town of Maidstone, includes the villages of Aylesford, Allington, Burham, Eccles, Bearsted, Hollingbourne, Thurnham, Harrietsham, Lenham, Sutton Valence, Loose, Boxley, Farleigh, Leeds, Boughton, &c. The services number 13,384, and there are 103 miles of mains.

The capital of the Company, as shown by the last accounts (June, 1928), is as follows:

CAPITAL STOCKS.

	£
5 p.ct. capital stock	122,640
5 " " " (additional)	43,096
Premiums on additional stock	17,387
	£183,123
Remaining to be issued	14,517
Total amount authorized	£197,640

LOAN CAPITAL.

	£
3 p.ct. debenture stock	35,370
3 " " " (additional)	28,110
	£63,480
Less—	
Discount on additional debenture stock	7,304
	£56,176
Remaining to be borrowed	6,074
Total amount authorized	£62,250

In addition, the Company has received the sum of £25,976 in premiums—£25,966 on ordinary capital and £10 on debenture stock.

Under the Gas Undertakings Act, 1929, the Company may borrow up to one-half of the amount of ordinary capital paid up *plus* one-half of the premiums received. It would appear, therefore, that the loan capital authorized at the present time is one-half of £183,123, *plus* one-half of the premium on ordinary capital, £25,966, or £104,544.

Transfer arrangements: Common form. Registration fees: Probate or distringas, 5s.; any other document, 2s. 6d. Stock (separate deed for each class) is transferable in multiples of £1; smallest holding allowed £10. Husband's witness of wife's signature or *vice versa* not accepted. Voting—1 vote for each £10 of capital stock.

Accounts and dividends: Accounts are made up to June 30 and submitted in August. Dividends are paid on March 1 (interim) and Sept. 1. The standard price of gas is 1s. 3½d. per therm; present price 9·2d. per therm; declared calorific value, 490 B.Th.U. per c.ft. Dividends on the capital stock are subject to sliding scale—viz., ½d. per therm above or below the standard price = $\frac{7}{10}$ p.ct. p.a. in dividend.

The following table illustrates the progress made by the Company during the past four years:

Year to June 30.	Average Price of Gas (Gross) per Therm.	Quantity Sold.	Capital Employed per Therm Sold.	Gross Profit. (*a*.)	Total Charge for Capital. (*b*.)	Rate of Dividend P.Ct per Annum.	Amount Carried Forward and Balance Reserve Fund.
	d.	Therms.	s. d.	£	£	£ s. d.	£
1925 .	9·6	2,034,619	2 3·2	19,293	17,899	8 10 0	24,359
1926 .	9·6	2,109,550	2 2·2	19,664	17,996	8 10 0	26,048
1927 .	10·7	2,194,820	2 1·2	16,212	14,634	8 10 0	26,241
1928 .	9·4	2,206,445	2 1·0	16,963	15,006	8 10 0	26,682

(*a*) Before deduction of income-tax.
(*b*) Including amount (if any) placed to reserve fund.

It will be seen that the gas sales are steadily increasing and the capital employed is gradually being reduced. The increase in the sales since 1925 is over 8 p.ct., whereas the capital per therm has been reduced by a similar percentage.

At the present price of gas, there is ample margin between the actual dividend and the authorized dividend, so that it is clear that the Directors have adopted a safe policy in distributing £8 10s. p.ct. only.

The following table shows the highest and lowest prices of the ordinary stock during the past four years, the dividend paid, and the yield p.ct. p.a. calculated on the average price:

Year.	Transactions.		Dividend.	Yield P.Ct. per Annum on the Average Price.
	Highest.	Lowest.		
			£ s. d.	£ s. d.
1925 .	132	123	8 10 0	6 13 4
1926 .	115$\frac{7}{16}$	114	8 10 0	7 8 2
1927 .	113½	108½	8 10 0	7 13 2
1928 .	128	109	8 10 0	7 3 6

The present average price is 126½, and yields £6 14s. 5d. p.ct., which, calculated on the last dividend, still leaves the stock an attractive purchase.

GERMAN GAS AND WATER ASSOCIATION.

During the recent visit to Berlin, several members of the Institution party expressed a desire to learn something of the internal organization of the kindred German Association who were their hosts. We have been favoured by a German correspondent with a few notes on the subject, which will be of interest to many of our readers.

The Deutscher Verein von Gas- und Wasserfachmännern was founded on May 21, 1859. Its object is the fostering and advancement of the gas industry, and it is the principal organization in Germany connected with the industry. The Chairman of the Association is *ex officio* Chairman of the Council, and his predecessor in office, who is Deputy Chairman, is also a member. There are six other members of the Council; the Business Director of the Association being always one of them. Of this total of eight members, at least two must be selected from undertakings producing more than 50 million cub.m. [about 1750 million c.ft.] of gas a year; one must be from the water industry; and one to represent the plant makers, &c.

In addition to the Council, there is a General Committee, which consists of one member from each of the affiliated Associations, the Chairmen of the six Sub-Committees of the Association, and two representatives of plant makers.

To deal with the various branches of the work, there are six Sub-Committees, which further divide themselves into the necessary Commissions. They work according to the directions and under the general supervision of the Council. A Sub-Committee, on completion of any task which has been set for it, or at the latest at the end of three years, is automatically disbanded. It is the duty of the Chairmen of Sub-Committees to arrange, at stated intervals, for discussions and a general exchange of experiences among the various specialized groups.

The affiliated Associations which, as already stated, have each a representative on the General Committee, are as follows: The Gas and Water Associations of the Middle Rhine, Silesia and Lorraine, Saxony and Thüringen, the Baltic, Austria, Bavaria, Lower Saxony; the Gas, Electric, and Water Associations of the Rhineland and Westphalia, and Mecklenburg-Pommerania; and the Central Gas Propaganda Bureau. Each of these Associations, as indicated by the names, comprises a different district of the country; and together they cover the whole of Germany and Austria.

The Sub-Committees, with their various Commissions at present in existence, are as follows:

I.—Education and Social.

Commissions:

1.—The education and keeping up to date of the technical and commercial officials of gas undertakings.
2.—Regulations as to tests of all kinds and their conditions.

II.—Gas—Science and Investigation.

Commissions:

1.—Accuracy of methods of measurement.
2.—Solidity tests and general evaluation of coke.
3.—Test methods for gas apparatus.
4.—Conversion of carbon monoxide.
5.—Condensates in mains and services.
6.—Illumination.
7.—Calorific value and specific heat of pure gases.
8.—Makers' guarantees for carbonizing plant.

III.—Gas—Technical.

Commissions:

1.—Gasholders.
2.—Meters.
3.—Consumers' apparatus.
4.—Street lighting.

IV.—Gas—Commercial and Management.

Commissions:

1.—Legal, taxation, financial organization, and conditions of supply.
2.—Tariff questions.
3.—Collection of accounts.
4.—Accountancy methods.
5.—Organization and Statistics.

V.—Gas—Distribution.

Commissions:

1.—Supply (theory, high and low pressure).
2.—Town distribution systems.
3.—Services.
4.—General questions affecting mains for gas and water supply.

VI.—Water.

The Association of Manufacturers of Gas and Water Plant (which is known as the Fagawa) is also corporatively affiliated, and, as already explained, elects representatives to the Council and the General Committee. It has also a separate organization of its own, with Sub-Committees to deal with special questions.

A highly important branch of the Association's activities is the Gas Institute, which it owns and finances, and which is attached to the Technical University at Karlsruhe. In addition to carrying on general research work under the highly skilled direction of Prof. Bunte, the Institute acts as general laboratory to the whole industry. Tests of all kinds, routine and otherwise, are undertaken for a small charge, and a special outside staff is available for undertaking large-scale tests at works which are members of the Association.

JUBILEE OF A FAMOUS FIRM.

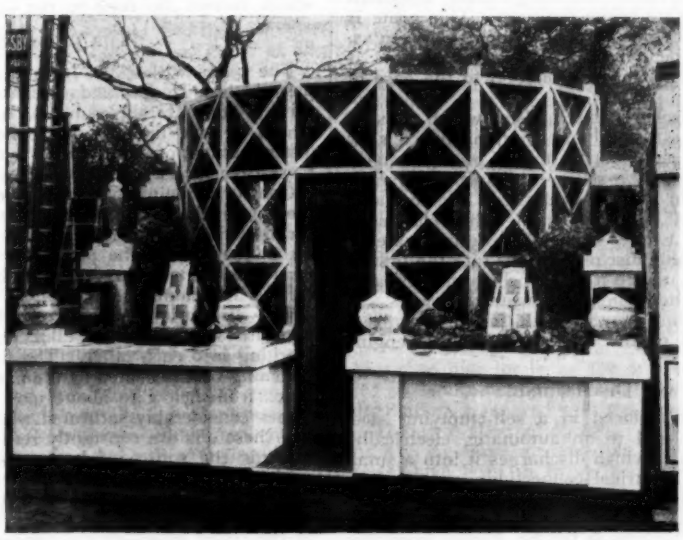
Through its pioneer work in several branches of gas-works construction, the firm of Aug. Klönne, of Dortmund, is known far beyond its native land; and we are happy to add our congratulations to many others on the celebration, on July 1 last, of the fiftieth anniversary of its foundation.

Even before he started the business, the original August Klönne, as a junior engineer, had taken out his first patents for retort settings with built-in producers, in which connection he was one of the pioneers of the direct heating of retorts, and the pre-heating of the combustion air by the waste gases. The Klönne settings of nine retorts soon became famous, and in the earliest years of the firm valuable connections were formed with England, Holland, and America. As early as 1881, the firm erected its first tank gasholder at Ludwigshafen, since when many hundreds have been turned out in its own workshops, which were founded in 1886. In the following year, a start was made with other branches of constructional engineering, including a bridge over the Nuhne, and general work involving the use of sheet-iron such as water tanks and silos; and in less than thirty years from its foundation, the firm increased its output from 817 to 26,000 tons a year, which included the erection of numerous complete gas-works at home and abroad, including distribution systems.

An important step was the introduction into gas-works practice of the horizontal chamber oven, by which the firm claims to have made the first step towards modern oven construction; and in 1908 further important progress was made by the erection of the first vertical chambers. Side by side with oven construction, continual improvements were being introduced by the firm in other branches of gas-works plant, especially in apparatus for coke treatment. In consequence of the growing importance of the quality of refractory materials, a fireclay and silica factory was acquired in 1920 with an entirely up-to-date laboratory, and in 1924 control was obtained of the Kemag iron and machinery works. In connection with gasholder construction, too, the name of Klönne has always been prominent, and recent developments in this direction are represented by their system of waterless holder, an exhibit of which attracted considerable attention at the Berlin Exhibition. Eight holders of this type are already in action, and others are in course of erection at home and abroad of over 2 million c.ft. capacity.

The firm of Aug. Klönne, which is one of the few that, in the changes of recent times, has maintained its private identity, will have the good wishes of the whole industry for many further years of development and prosperity.

GAS EXHIBIT AT CHELSEA FLOWER SHOW.

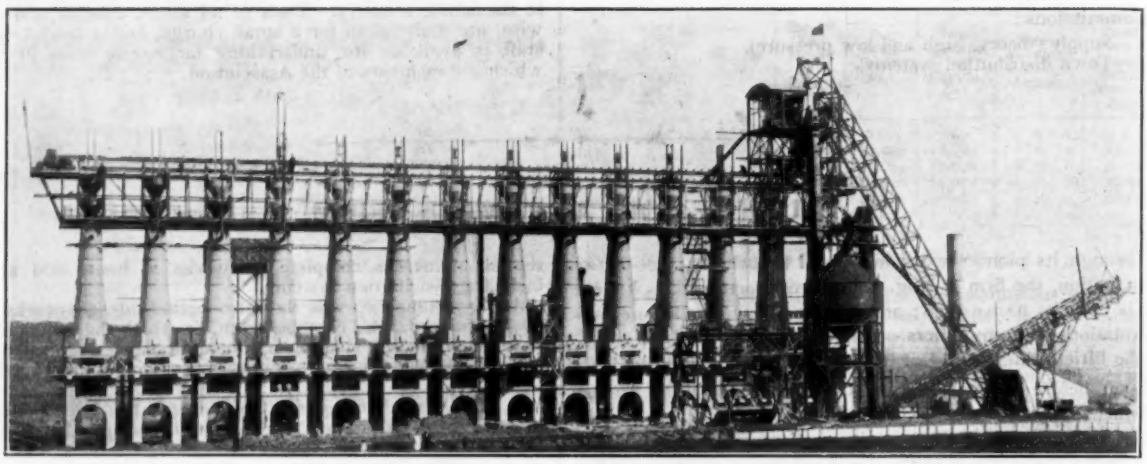


The South Metropolitan Gas Company's exhibit at the Chelsea Flower Show this year illustrated in an attractive manner the important part the gas and coke oven industries play in aiding the efforts of farmers and horticulturists generally to keep our country "green and pleasant." Of the many different bye-products the Company produces, only those were shown that are of particular interest to agriculturists and horticulturists—viz., dry neutral sulphate of ammonia, wood preservative, tar oil winterwash (which is specially prepared to control the pests on fruit trees, notably the capsid bug), copperas, and road tar.

BUSSEY COAL DISTILLATION PLANT.

Inauguration of a Large Installation at Glenboig.

Last year it was decided to introduce into Britain the coal distillation system invented by the late Mr. Charles C. Bussey, whose work resulted in the erection in 1922 of an experimental station at Louisville, Kentucky. Subsequently the retort was further developed in the United States by Mr. R. B. Parker. Glenboig, in Scotland, was selected for what is intended to be the first of a series to be erected in Britain. Subsequent ones will be in Nottinghamshire, Derbyshire, Yorkshire, and Lancashire. The Glenboig installation is a big one; and its official opening on Friday last was a memorable function locally, as well as to those who were invited to participate in it.



GENERAL VIEW OF THE BUSSEY PLANT AT GLENBOIG.

Before making further reference to the opening ceremony, it may be well to explain to readers as briefly as possible the principal features of the Bussey coal distillation process.

The Retort.

The Bussey retort is simple in design, and its cost of construction is said to be low. The structure consists of a steel stack, lined with firebrick and supported on a concrete base. Its general form is that of a truncated cone of oval horizontal cross section; the coking chamber being 30 ft. high, 2 ft. square at the top, and 8 ft. by 3 ft. at the base.

As the process demands the maintenance of a vacuum at the top and a pressure at the base of the apparatus, it is equipped with specially designed double feed-hoppers, fitted with interlocking valves operated by hydraulic cylinders on top of, and a similar arrangement of double discharge-hoppers below, the retorts. In normal operation, the retort chamber is kept completely filled with coal at all times, the charge being supported on a rectangular floor or grate below the base. This grate is hollow, and divided into sections, through which the air, gas, and steam necessary for the operation are admitted, and is adjustable as to its vertical position in relation to the base of the retort.

Above the grate is the discharge mechanism, which consists of a hollow water-cooled cast steel cutter-bar, having a slow reciprocating movement at right angles to the grate's longest dimension. This as actuated by a screw mechanism driven by a small motor. The bar, in moving backwards and forwards across the grate, pushes off the coke from either end alternately. Its speed may be varied to suit the desired rate of operation. The carbon residue discharged falls into the first of the air-tight hoppers below, where it is quenched with exhaust steam supplemented when necessary by a water spray.

The products of combustion, together with the gases evolved, are removed from the top of the retorts by a steam-engine driven exhauster.

Charging and Discharging.

The coal is unloaded and placed in a self-emptying steel bin, from which it is delivered to an automatic, electrically-driven, self-loading skip-hoist, which discharges it into a small hopper above the retorts. Electrical connections, governed by the depth of coal in this hopper, automatically control the movement of the hoist in such a manner that the hopper is maintained full at all times. The coal is fed by gravity from this small hopper to the two upper feed hoppers on the retorts, which are also maintained full at all times.

The cycle of operation is as follows: The mechanism operating the cutter-bar which discharges the retort is set in motion, and as it completes its first movement across the grate it operates the mechanism controlling the operation of the discharge valve on the upper feed-hopper to which it is connected, and causes this valve to open, allowing the coal to fill the lower feedhopper. This valve automatically closes and locks shut. The cutter-bar then reverses its direction of travel, and as it completes its return stroke it causes the valve on the lower feed-hopper to open, and allows the coal to fill the retort, after which this valve also automatically closes and locks shut.

Provision has been made for separate manual operation of these feed-valves if desired; but the mechanism is so arranged that only one valve can be opened at a time, and both valves automatically close if not held open. This is a necessary precaution, because of the vacuum normally maintained in the top of the retort.

The carbon residue discharged from the base falls into the first of the discharge hoppers, where it is quenched as received; and when a sufficient quantity has accumulated, it is dropped to the lower discharge hopper, and from that to the conveyor, which carries the coke to the screening plant.

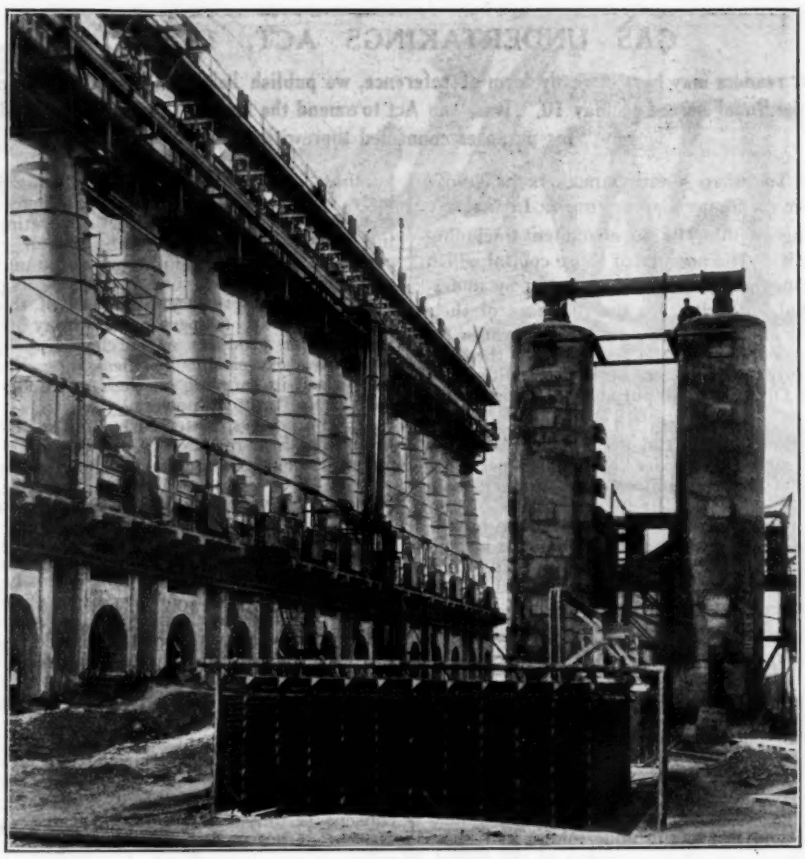
The Working Process.

The gases withdrawn from the retort by the exhauster are passed through a standard bye-product recovery plant comprising condensers, scrubbers, and other cleaning apparatus which remove the oils and condensed water vapour. These latter are then passed through separators, and the oil is pumped to storage tanks for sale or for subsequent refining.

Control is maintained by varying the suction at the top, the pressure at the base, the amount of air, gas, and steam admitted through the grate, and the rate of operation of the discharge mechanism. By the proper manipulation of these factors a graduated temperature from the bottom to the top of the retort can be maintained as desired.

The distillation may be considered as divided into three separate stages, which take place in three separate zones merging into each other. The first stage is that in which the incoming coal is heated by the passage through it of the evolved gases from below to about 300° Fahr. The mass of coal becomes considerably saturated with condensed oils in this zone; and these oils are constantly returned with the descending coal towards the source of heat, where they are revaporized and again ascend towards the gas outlet.

The heavier portions fall with the coal into the second stage, or distillation zone, which may be considered as that portion of the retort in which the temperature range is between 300° and 800° Fahr. In this zone the charge is in a somewhat pasty mass, thoroughly saturated with the condensed oils returned from above. The lighter portions of these oils are vaporized, and join the gases evolved from the coal in their upward sweep through the superimposed portion of the charge. A considerable amount of the heavier portions, or pitches, from these oils join and fuse into the mass of carbon residue,



RETORTS AND PART OF THE OIL RECOVERY PLANT.

and eventually pass through the combustion zone, and thence out of the retort as pitch coke incorporated with the mass.

The third stage is that of hardening or setting the carbon residue and lowering its volatile content to the desired point. This takes place in the last or combustion zone, in which the gas and air are burned to supply the necessary heat to carry on the process. Considerable quantities of carbon monoxide and hydrogen are also produced in this zone by the action of the steam introduced through the incandescent carbon mass.

At Glenboig.

The Glenboig installation, which was officially opened last Friday, is stated to be the largest low-temperature unit in the world for the treatment of bituminous coals. It consists of fourteen retorts with power house, storage tanks, and other equipment.

It will treat between 600 and 700 tons of Scottish coal per day, producing 450 tons of smokeless fuel, 20,000 galls. of oil, and 20 million c.ft. of gas. It is stated that tests have shown the coke to be suitable for smokeless combustion in the domestic grate, and that the retorts can be run to give a product having a volatile content, as desired, anywhere between 2 and 12 p.ct. The gas is of medium calorific value, and is suitable for engines, boiler firing, furnace heating, and general work.

The inauguration of the plant was a great occasion locally; and a large number of guests travelled from London and back by private express trains. A tour of the plant was made, finishing at the power house, where the ceremony of starting the new works was performed. This was to have been carried out by the Home Secretary (the Right Hon. J. R. Clynes); but unfortunately an important Parliamentary debate made it impossible for him to leave town. "Had I been present," he said in a message, "I would have said something concerning the bearing of coal distillation on unemployment problems and economic conditions. As it is, I can only wish every success and prosperity to the Glenboig undertaking." The plant was set in motion by Lord Elmley, M.P., who was supported on the platform by the Duke of Montrose, and other distinguished visitors.

The Chairman's Statement.

Mr. Aubrey Powell (the Chairman of Bussey Coal Distillation), before calling upon Lord Elmley, gave an outline of what has been done and what it is hoped to accomplish. In the course of his remarks, he said: In opening this plant to-day, we believe we open a new era of prosperity, not only for our coal mines, but every strata of industry in which coal plays its part. In our coal mines we have an asset greater than that enjoyed by any other nation in the world. It was our coal which helped to make us the greatest industrial power in the world, and it is our coal which is going to enable us to maintain that position. We are now standing within the largest low-temperature bituminous coal distillation plant in the world. Perhaps, not unnaturally, we are a little proud of that fact, as we regard it as one more instance of Great Britain not being entirely last in industrial endeavour, as some would almost persuade us we are.

It would be impossible to open this plant to-day without paying tribute to those who have been responsible for its erection. That in reality includes everyone in our organization. I think you will agree with me that it would be difficult to find a finer example of skill in designing, efficiency in execution, and thoroughness in workmanship than that exemplified by this plant. It is to Mr. R. B. Parker that the credit goes for bringing the Bussey process to a commercial success. It is Mr. Parker who designed and erected this plant. He has spent his life in studying coal distillation in all its phases; and there is no man living who knows more about this subject, or who is better qualified to put his knowledge to practical use. Our field engineer, Mr. Eborall, must be congratulated. His work has been difficult and trying; but he has the satisfaction of having brought into being the greatest coal distillation plant in existence. From now on the operation will be under the control of Dr. Haslam; and with his great knowledge of coal distillation, it could not be in better hands.

We also owe a very great debt of gratitude (which I hope Bussey gas will repay) to Mr. James Dunnachie. The plant is on his property, and adjacent to his Glenboig Union Fireclay Company. Glenboig bricks, the best in the world, line our retorts. It is from these retorts that he will receive gas for his brick kilns. Quite apart from all the help and co-operation he has given us during this past year, we should "take off our hats" to him for being the first to realize the enormous saving to be effected by the use of clean gas as obtained from coal distillation, compared with the old-fashioned dirty producer gas.

To-day is the real opening of the plant, but perhaps I ought to say we have already had some preliminary tests. These tests have been in every way satisfactory, and have proved beyond doubt that British coals can be successfully and profitably treated by the Bussey process. Contracts have been entered into for the disposal of our oil and gas; and from numerous inquiries already received, we are satisfied as to the market for our coke. We may claim, therefore, that the distillation of coal has now passed the experimental stage, and has been definitely established on a commercial scale. It comes, as everything does come to this wonderful country of ours, at a psychological moment, and spells employment for our unemployed and prosperity for the nation as a whole.

GAS UNDERTAKINGS ACT, 1929.

In order that our readers may have a ready form of reference, we publish below the Gas Undertakings Act, 1929, which received the Royal Assent on May 10. It is "an Act to amend the law with respect to gas undertakings, and for purposes connected therewith."

POWER OF BOARD OF TRADE TO MAKE ORDERS INCREASING AUTHORIZED AMOUNT OF SHARE CAPITAL OR OF LOANS.

1.—(1) Notwithstanding anything in any enactment (including this Act) imposing a limit on the amount of share capital which may be raised or of money which may be borrowed by undertakers, not being a local authority, for the purposes of their undertaking, the Board of Trade may, on the application of any such undertakers and subject to the provisions of this section, by Order authorize the undertakers on such conditions as may be specified in the Order for the purposes of their undertaking—

(*a*) to raise, at any time during the period of three years after the date on which the Order comes into operation, any such amount of share capital as may be specified in the Order; and

(*b*) to borrow on mortgage of their undertaking or by the creation and issue of debenture stock any amount not exceeding the aggregate amount of the paid up share capital of the undertaking for the time being and of any premiums paid in respect thereof.

(2) An Order shall not be made under this section except with the consent of the local authority:

Provided that if, in the opinion of the Board of Trade, the consent of the local authority is unreasonably withheld, the Board may, in the case of applicants who have within the period of fifteen years preceding the date of the application obtained in relation to their undertaking either a Special Act or a Provisional Order confirmed by an Act, make the Order notwithstanding that such consent has not been given.

(3) An Order under this section may contain such modifications of any enactment applying to the undertakers in respect of whom the Order is made, as, in the opinion of the Board, are necessary in order to give full effect to the Order.

AUTHORIZED AMOUNT OF LOANS.

2. Notwithstanding anything in any enactment, undertakers, not being a local authority, may borrow for the purposes of their undertaking on mortgage of their undertaking or by the creation and issue of debenture stock, any amount not exceeding one-half of the aggregate amount of the paid up share capital for the time being of the undertaking and of any premiums paid in respect thereof.

INCREASE OF AUTHORIZED AMOUNT OF RESERVED FUND OR OF SPECIAL PURPOSES FUND.

3.—(1) Section 31 of the Gas-Works Clauses Act, 1847 (which provides for the formation of a reserved fund of a limited amount), and section 33 of that Act (which provides for the case where that fund amounts to the prescribed sum) shall, in the case of undertakers not being a local authority, have effect as if for the references therein to a sum equal to one-tenth of the nominal capital of the undertakers there were substituted references to a sum equal to one-tenth of the aggregate amount of the paid up share capital of the undertakers, of any premiums paid in respect thereof and of any outstanding loans raised by the undertakers on mortgage or by the creation and issue of debenture stock.

(2) Where any enactment applying to any such undertakers as aforesaid authorizes the formation of a special purposes fund and limits the amount of that fund by reference to the paid up capital of the undertaking, the said enactment shall have effect as if for the reference to the paid up capital of the undertaking there were substituted a reference to the aggregate amount of the paid up share capital of the undertaking, of any premiums paid in respect thereof, and of any outstanding loans raised by the undertakers on mortgage or by the creation and issue of debenture stock.

(3) Where at any time, by reason of any reduction in the amount of outstanding loans, the amount of a reserved fund formed by undertakers in pursuance of the said section 31 is in excess of the amount authorized by that section as amended by this section, the amount of the excess shall forthwith be carried by the undertakers to the credit of their net revenue account.

(4) Any special purposes fund formed by undertakers in pursuance of any enactment may be maintained at any amount to which it has lawfully been raised in pursuance of that enactment as amended by this section, notwithstanding any subsequent reduction in the amount of outstanding loans.

EXTENSION OF POWERS OF PURCHASE OF RESIDUAL PRODUCTS.

4.—(1) Any undertakers may, notwithstanding anything to the contrary contained in any Act or Order relating to them, purchase in such quantities as they think fit from any company, body, or person carrying on a gas undertaking (whether with or without statutory authority) or operating coke ovens or carrying on any process of carbonization or gasification of coal or coke any residuals arising from the manufacture of gas, or the carrying on of any such operation or process and products arising from a primary treatment of those residuals by such company, body, or person, and may exercise in relation to residuals or products so purchased the powers which would have been exercisable by them if such residuals or products had arisen in carrying on their gas undertaking in accordance with their statutory powers.

(2) The powers conferred by this section shall be in addition to and not in derogation of any powers conferred or to be conferred upon the undertakers by any special Act.

SUPPLY OF GAS BY UNDERTAKERS TO PREMISES OUTSIDE LIMITS OF SUPPLY.

5.—(1) The Board of Trade, if they are satisfied that the owner or occupier of any premises, not being within a distance of twenty-five yards from any main of the undertakers within whose limits of supply the premises are situate, desires to obtain a supply of gas from other undertakers, may, subject to the provisions of this section, by Order authorize the last mentioned undertakers to supply gas to those premises on such conditions as may be specified in the Order.

(2) An Order under this section may contain such modifications of any enactment applying to the undertakers in respect of whom the Order is made as, in the opinion of the Board, are necessary in order to give full effect to the Order.

(3) An Order shall not (unless, in the opinion of the Board, consent is unreasonably withheld) be made except with the consent of the undertakers within whose limits of supply the premises are situate, and of the local authority within whose area the premises are situate.

(4) Notwithstanding anything in this section, every Order thereunder in respect of any undertakers shall be framed so as to secure that the provisions of the Gas-Works Clauses Act, 1847, with respect to the breaking-up of streets for the purpose of laying pipes shall apply in relation to pipes for the supply of gas by the undertakers under the Order as they apply in relation to pipes for the supply of gas by the undertakers under the enactments applying to them before the making of the Order.

UNDERTAKERS SUPPLYING MORE THAN A CERTAIN QUANTITY OF GAS TO CHARGE ON BASIS OF BRITISH THERMAL UNITS.

6.—(1) Where any undertakers who are not authorized by any enactment or by any Order under section 1 of the principal Act to charge for gas according to the number of British Thermal Units supplied have, in any year subsequent to the year 1927, supplied more than 20 million c.ft. of gas, they shall, in respect of gas supplied by them on or after the appointed day, charge therefor according to the number of British Thermal Units supplied, and the maximum or standard price, in respect of gas supplied by any such undertakers on or after the appointed day, shall be a price per therm of such an amount as is produced by dividing by five the maximum or standard price per 1000 c.ft. authorized immediately before the appointed day by any enactment applying to the undertakers.

(2) For the purpose of giving effect to this section, the Board of Trade shall, in respect of each of the undertakers to whom this section applies, make an Order which may contain such provisions as are authorized or required by sub-section 4 of section 1 of the principal Act to be contained in an Order under that section.

(3) Sections 2, 5, 6, 7, and 9 of the principal Act shall apply to all undertakers to whom this section applies as if those undertakers were undertakers with respect to whom an Order under that Act had been made and as if the provisions contained in this section or in any Order made thereunder were contained in that Act.

(4) So much of any Special Act or Provisional Order applying to any such undertakers as makes provision with respect to the quality, pressure, or purity of gas supplied by them shall, as from the appointed day, cease to have effect.

(5) For the purposes of this section, the appointed day shall—

(*a*) as respects any undertakers who, in the year 1928, have supplied more than 20 million c.ft. of gas, be such day not later than April 1, 1930, as the Board of Trade may prescribe by the Order made under this section in respect of those undertakers; and

(*b*) as respects any other undertakers to whom this section applies, be Jan. 1 in the second year after the year in

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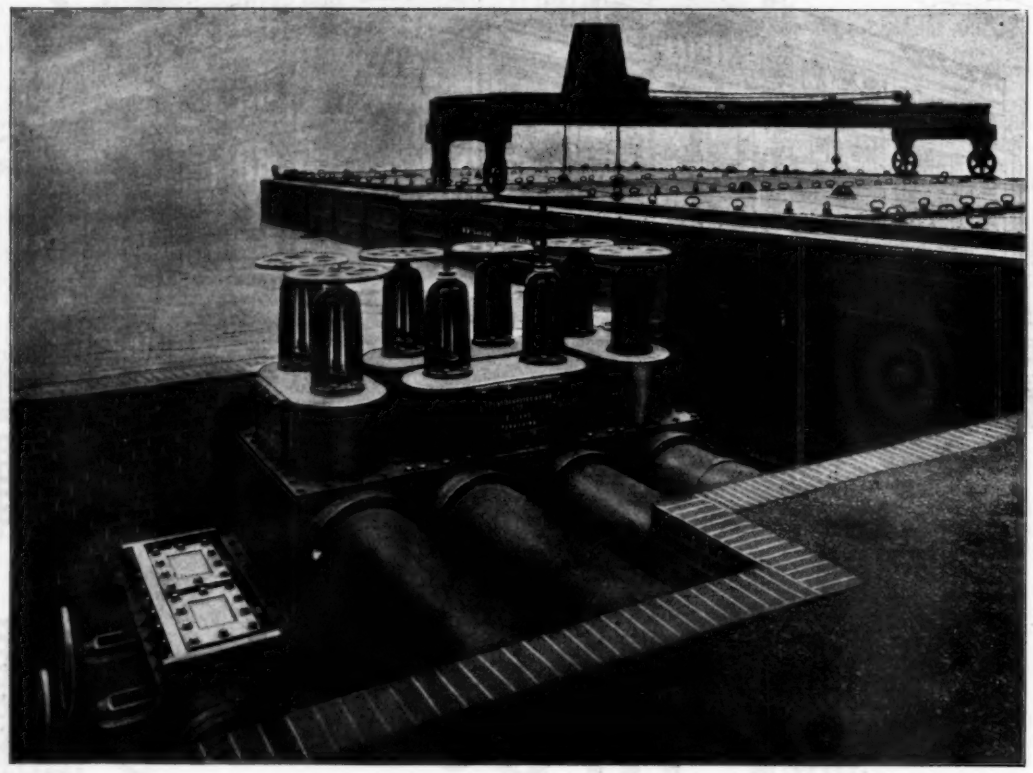
PURIFIERS.



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EXTENSION OF BOARD OF TRADE'S POWER TO MAKE SPECIAL ORDERS UNDER PRINCIPAL ACT.

7. The power of the Board of Trade to make Special Orders under section 10 of the principal Act shall include power to make a Special Order—

(*a*) authorizing the applicants therefor to construct gas-works or manufacture or supply gas in any area within the limits of supply of any existing undertakers who have failed to lay down or provide mains for the supply of gas in the area, and prohibiting the existing undertakers from exercising in the area any of the powers conferred on them in respect of their undertaking;

(*b*) providing, where the applicants for the Order are a company authorized by any enactment to supply water or electricity as well as gas, that any loan lawfully raised by the company for the purposes of so much of their undertaking as relates to gas may be secured by a charge upon the whole of their undertaking;

(*c*) making provision for modifying any enactment regulating the gas undertaking to which the Order relates by inserting therein provisions corresponding to provisions contained in any special Acts or Provisional Orders regulating other gas undertakings:

Provided that no Order shall be made under paragraph (*a*) of this section in relation to any area within the limits of supply of existing undertakers unless five years have elapsed since the date on which those undertakers first obtained their powers to lay down or provide mains for the supply of gas in that area.

MINOR AMENDMENTS OF PRINCIPAL ACT.

8. The amendments specified in the second column of the Schedule to this Act, being minor amendments of the principal Act, shall be made in the provisions of that Act specified in the first column of that Schedule.

INTERPRETATION.

9. In this Act, unless the context otherwise requires, the following expressions have the meanings hereby respectively assigned to them, that is to say:

"Debenture stock" in relation to any undertakers means debenture stock created and issued subject to, and in accordance with, the provisions of Part III. of the Companies Clauses Act, 1863, as applying to those undertakers:

"Enactment" includes any public general Act, any Special Act, and any Provisional Order confirmed by an Act:

"Principal Act" means the Gas Regulation Act, 1920:

"Share capital" includes stock not being debenture stock:

"Undertaking" means gas undertaking.

SHORT TITLE, CITATION, CONSTRUCTION, AND EXTENT.

10.—(1) This Act may be cited as the Gas Undertakings Act, 1929, and the principal Act and this Act may be cited together as the Gas Undertakings Acts, 1920 and 1929.

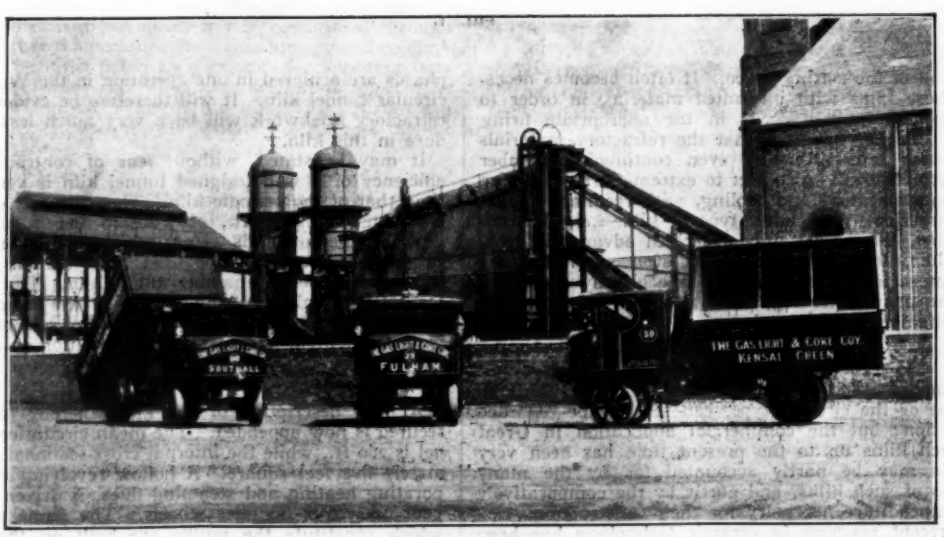
(2) Except where the context otherwise requires, references in this Act to the principal Act shall be construed as references to that Act as amended by this Act, and this Act shall be construed as one with that Act.

(3) This Act shall not extend to Northern Ireland.

SCHEDULE.

MINOR AMENDMENTS OF GAS REGULATION ACT, 1920.

Provisions To be Amended.	Amendments.
Section 1 - -	At the end of sub-section 3 there shall be added the following provision: If at any time it appears to the Board of Trade, in relation to any undertakers, that there has since June 30, 1914, been any increase or decrease in— (*a*) the rate of interest which the undertakers are obliged to pay on capital raised or money borrowed for the purposes of their gas undertaking; or (*b*) the cost to the undertakers of providing works, plant, or apparatus, for the supply of gas; or (*c*) the annual output of their gas undertaking; or (*d*) the efficiency with which that undertaking has been carried on; the Board may make an Amending Order under this section revising the powers of charging authorized by the Original Order with respect to the undertakers, in such manner as to secure that they are not prejudiced by any such increase or benefited by any such decrease. In sub-section 7, after the words "mercury and" there shall be inserted the words "(except as otherwise prescribed by the Gas Referees)."
Section 4 - -	In proviso (*b*) to sub-section 3 after the words "within the county" there shall be inserted the words "who are not themselves the undertakers," and for the words "that local authority" there shall be substituted the words "the local authority."
Section 6 - -	In sub-section 2, for the words "seven days" there shall be substituted the words "twenty-one days."
Section 9 - -	In sub-section 1 the words "on any day" and the words "on the same day" shall be omitted.
Section 18 - -	For the definition of the expression "quarter sessions" there shall be substituted the following definition: The expression "quarter sessions" means the quarter sessions for the area of any local authority which has failed to appoint a gas examiner or for any area in which the testing of gas is imperfectly attended to.



THREE "SUPER SENTINEL" THREE-WAY TIPPERS RECENTLY SUPPLIED TO THE GAS LIGHT AND COKE COMPANY, WHO HAVE USED COKE-BURNING "SENTINELS" FOR MANY YEARS PAST.

DEVELOPMENTS IN KILNS FOR BURNING REFRACTORY MATERIALS.

By A. N. TARRANT.

It is a strange anomaly that in a period when the technical and economic importance of the use of high-grade refractory materials for the construction of carbonizing chambers is fully appreciated, so little progress should have been made in the design of kilns for "burning" or "firing" these materials.

The high standard of efficiency of the modern carbonizing plant is largely attributable to the refractory materials which play so important a part in the construction of such plants. Is it not, then, an anachronism, that in the majority of cases the firing of such refractories is performed in a far from scientific manner? It is believed that at least 80 p.ct. of the kilns at present employed in this country are of the inefficient, unrecuperative, periodic type.

PERIODIC AND CONTINUOUS CHAMBER KILNS.

The fuel consumption of such kilns is exorbitant, while any required temperature conditions are only obtained over a small proportion of the setting space. It often becomes necessary to set these kilns with unwanted material, in order to fire more urgently wanted goods in the appropriate firing zones. It will also be apparent that the refractory materials from which such intermittent or even continuous chamber kilns are constructed will be subject to extreme stresses set up by the continuous heating and cooling, with resultant expansion and contraction. The latter type of kiln—*i.e.*, the continuous chamber kiln—is certainly a decided advance in technique over the intermittent type, but, even so, has many failings, the more important being the one already cited, and the fact of the uneven heating, particularly in respect of the ends of the chambers.

TUNNEL KILNS.

The more modern type of tunnel kiln, which may either be of the straight or the circular type, can scarcely be regarded as an innovation; but the commercial application in Great Britain of such kilns up to the present time has been very limited. This may be partly accounted for by the many earlier failures of such kilns, and partly by the comparatively high initial expenditure necessary for their construction.

However, recent progress in ceramic technology has been responsible for the minimizing of earlier defects; and it may now be claimed that perfection has been attained in at least one type of tunnel kiln. The one particularly referred to is the Woodall-Duckham circular tunnel kiln. The saving effected on the costs of operating such kilns quickly offsets their somewhat higher initial capital outlay.

WOODALL-DUCKHAM CIRCULAR TUNNEL KILN.

This kiln should be of general interest to the gas and coke oven industry as a potential means for the efficient firing of refractories. The phrase "potential means" has been used advisedly, since the only kiln of this type at present operating (as distinct from those under present course of construction) in Great Britain is at present utilized solely for firing in a "green" state glazed fireclay sanitary ware, in one operation. It will be appreciated that this is possibly the most difficult of all tasks for the ceramist to perform. With many tunnel kilns of the straight type, it is necessary to bone-dry the ware in separate tunnels before firing, while firing and glazing are often two further distinct operations. These phases are achieved in one operation in the Woodall-Duckham circular tunnel kiln. It will therefore be evident that burning refractory brickwork will be a very much less difficult procedure in this kiln.

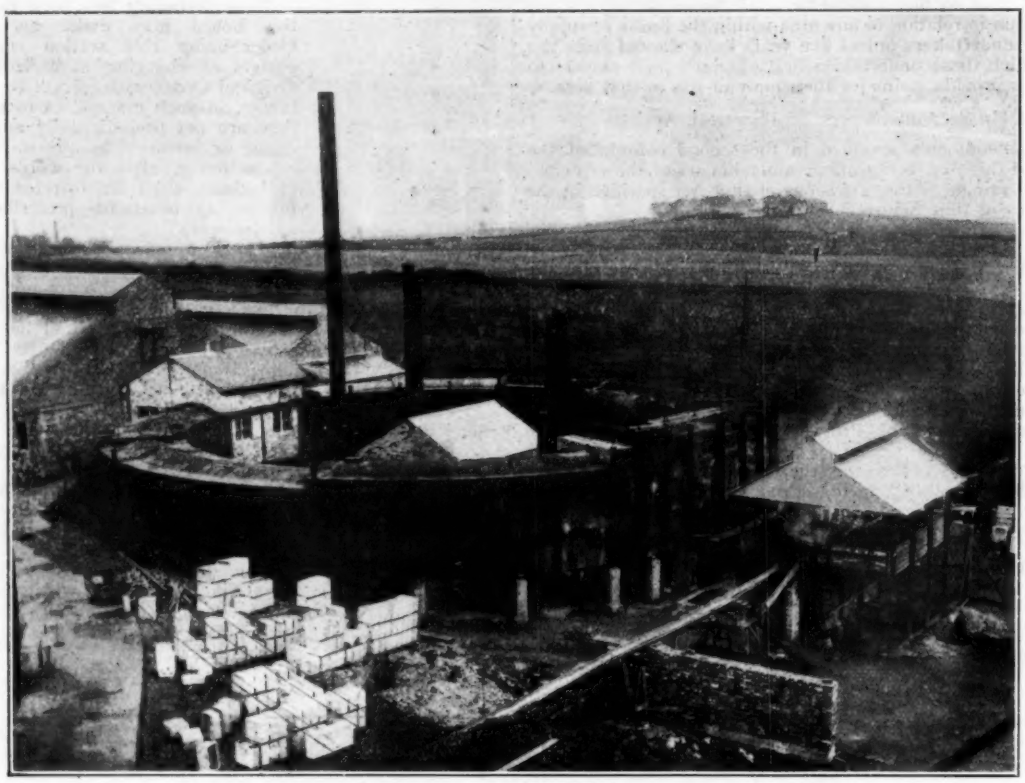


FIG. 1.

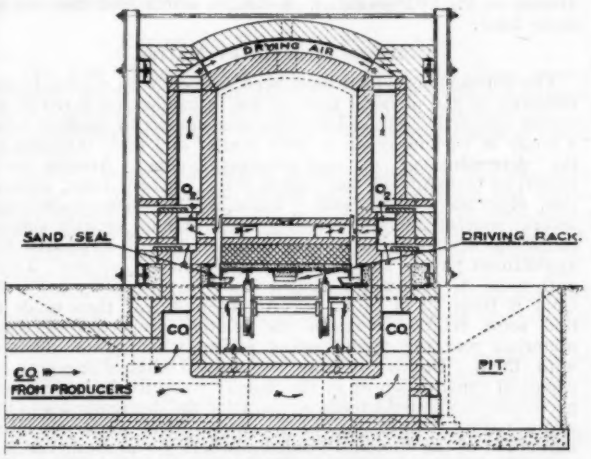
It may be stated, without fear of contradiction, that the efficiency of a well-designed tunnel kiln is very much higher than that of the periodic kiln. Thus the fuel consumption for 0·86 ton, or 74·2 c.ft., of ware in the circular tunnel kiln described hereunder is 1 ton, while usually only 0·24 ton, or 21 c.ft., of ware may be fired by a similar weight of fuel in the best types of chamber muffle kiln. The labour required for setting, unloading, and firing of the former kiln is only half of the latter, while 100 p.ct. of the refractory throughput is perfectly fired, irrespective of its position on the tray.

DESCRIPTION.

A brief description of the kiln whereby these results are secured is now appended. The mean circumference of the tunnel is 260 ft., while the internal cross-sectional area is approximately five feet square. A hollow revolving tray floor, incorporating heating and steaming flues, is driven by a rack spur gear and rests on idler wheels. The flame protecting walls which constitute the muffle are built on the edges of this tray. Fig. 1 illustrates the kiln and shows the loading and unloading house which is in close proximity to the manufac-

turing shed. The ends of the kiln, which terminate within the former building, are not closed in any way, for reasons which will be indicated later. Diametrically opposed to the loading shed will be seen the producers from which the gases pass through a short main into the combustion chambers. The interior of the kiln is sealed from atmosphere (along its moving surfaces) by sand seals which, by virtue of the circular motion of the kiln, require no attention. Thus the displacement of the sand is continuous, but is at all places similar. The principle of operation may be best described in five stages: Drying; preheating, and driving off combined water; firing or vitrifying; maturing; and cooling.

Drying.—"Green" material without "grog admixture" may be safely admitted into the kiln without fear of "bursting." Thus during its first 25 ft. of travel the ware is only dried by convection currents of air from the open end of the kiln, and is not heated by waste-gas flues during this phase. At the end of this section there is an offtake to which the free moisture is conveyed, and from which it is eliminated. At this point also is the final, controlled waste-gas offtake from the muffle to the main waste-gas flue.



CROSS SECTION THRO' WD CIRCULAR TUNNEL KILN AT COMBUSTION ZONE

Fig. 2.

Preheating.—From this point onwards the refractory materials are externally heated by waste gases of gradually increasing temperature. At this stage the tray floor is ventilated, thereby providing outlets for the chemically combined moisture, which is removed, as evolved, through controllable off-takes at tray level into the muffle. An ingenious system makes it possible to ventilate this section, but to dispense with such ventilation in the firing, maturing, and cooling zones, where it would be deleterious, since it would probably mark and "dunt" the ware. Tiles resting on cones which collapse at 700° to 800° C. are placed over the ventilating holes, which thus automatically become sealed at a temperature not exceeding 800° C. From this point onwards the articles under treatment are under muffle conditions, through the stages of higher temperature firing, maturing, and cooling.

Vitrifying.—The main firing zone extends for approximately 30 ft., and temperature control of this section is effected at eighteen positions on each side of the kiln. Fig. 2 shows a characteristic cross-section of this zone. The general lay-out is similar in the other zones, except that first the secondary air side flues become waste-gas heating flues in the preheating zone, and, secondly, that the heating flues which are shown in the tray floor and which correspond to ports around the kiln become cooling flues in the outlet section, and moisture offtakes in the preheating section. Likewise, in the latter section, the producer gas flues are omitted.

Maturing.—After the main firing zone, the ware is maintained at such temperatures as to allow of its maturing before finally passing to the cooling zones. During its passage through the maturing zone the mechanical and chemical changes in the refractory materials are completed.

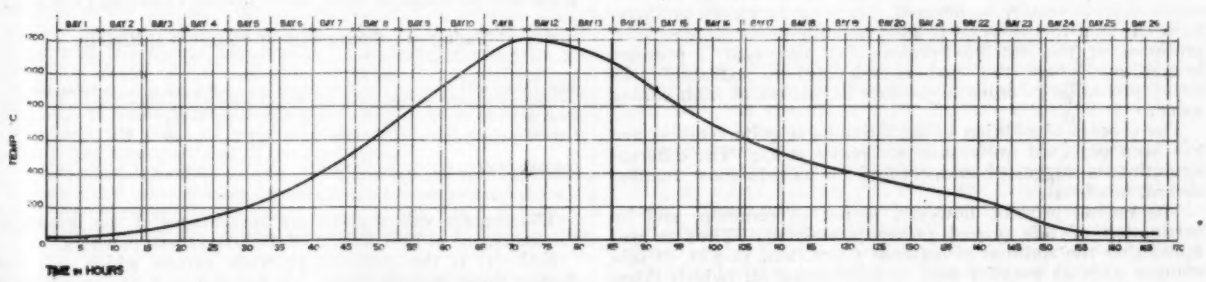
Cooling.—The temperature of the ware leaving the kiln is only 5° C. higher than that at which it enters. This is illustrated in fig. 3, which is the temperature curve based on continuous readings of a thermocouple. It clearly depicts the gradual heating and cooling of the kiln ware. The outlet end of the kiln is open, and secondary air is drawn in and passes through the goods for approximately 30 ft., thus cooling them in its passage. It is itself thus subjected to a preliminary heating before passing into the muffle, where it is further heated. The requisite volume is finally conveyed under pressure to the combustion chamber, while air in excess of the firing requirements by-passes the combustion chamber and travels along the flues in the crown of the kiln (as fig. 2). It is then admitted, where required, into the drying sections of the kiln.

FEATURES.

Additional special features of this kiln whereby it proves its superiority over other types of tunnel kilns are:

1. Absolute temperature control over all sections of kiln. Goods can be fired to any pre-arranged temperature curve schedule.
2. Even heating of the ware is secured throughout, irrespective of its altitudinal and lateral placement. Continuous recording pyrometer readings indicate only a 5° C. difference in temperature at tray floor and at roof levels.
3. Loading and unloading is at one position. The width of the loading space allows all loading and unloading to be carried out in one shift, and Sunday work may be eliminated.
4. The maintenance of the tray floor is negligible. The efficiency of its insulation and ventilation is such that the temperature of the tray steelwork never exceeds 100° C. This is an important feature. In many straight tunnel kilns, mechanical difficulties with trucks and rails are frequently experienced.
5. By reason of its compactness and the comparatively small ground space it occupies, it is usually much better adapted to normal sites. The mean circumference of 260 ft. indicates an external diameter of approximately 88 ft. This may be contrasted with certain straight tunnel kilns, of which instances may be recorded where the combined length of pre-drying and firing sections has amounted to 650 ft.
6. The removal of free and combined moisture, which are eliminated from the kiln immediately as evolved, obviates marking of goods.
7. At every point in the cycle of operation each individual article is under treatment in its correct kiln atmosphere, and is not affected by products evolved from other articles either in front or behind.

The fact that a number of orders have already been placed for the kiln described above for general purpose firing, shows that it has been possible to prove the absolute reliability and efficiency of at least one type of continuous tunnel kiln wherewith to replace the older inefficient periodic chamber type kilns.



WD CIRCULAR TUNNEL MUFFLE KILN

THERMOCOUPLE READINGS TAKEN AT SOUTHHOOK POTTERIES

JANUARY 6TH TO 15TH 1929

FIG. 3.

THE COKING OF COAL.

By M. BARASH, M.Sc. (Tech.), F.I.C., Research Department, West's Gas Improvement Company, Ltd.

Read on July 12 before the Society of Chemical Industry at the Annual Meeting in Manchester.

(*Concluded from p.* 140.)

"NEGATIVE" AGGLUTINATING PROPERTIES.

The results of the above investigations have clearly shown that the infusible portion of coals can be readily affected to such an extent that the coals become non-coking even while the agglutinants mainly responsible for coking are still present and are unaffected. It was suspected at this stage that this process could probably be carried further to the extent that the coal would exhibit "negative" agglutinating properties. In other words, instead of sharing the agglutinating properties of an added coking coal, the treated coal would cause a reduction or destruction of the expected mean coking properties of the mixture. This was confirmed in a number of mixtures which were examined.

As a preliminary, several mixtures of untreated coals of known agglutinating value were tested, and it was found that invariably a mixture of two untreated coals gave the average agglutinating value and volatile matter yield of the components, though the degree of swelling was usually lower than would be expected.

The first mixtures in which negative agglutinating properties of one of the constituents was suspected were the reconstituted coals made up from the alpha, beta, and gamma fractions. Thus, for example, the reconstituted Coal B gave an agglutinating value of 1 : 3, while if the alpha-fraction had behaved purely as inert matter (as electrode carbon), the value should have been about 1 : 7 (calculated from the yield and agglutinating values of the beta and gamma fractions). The coke from this mixture was slightly shrunken though hard, while the coke from the original coal showed a swelling of 400 p.ct.

The following two experiments with Coal A mixtures are particularly interesting from this point of view; the data given being self-explanatory:

1—

50 p.ct. Coal A	Agg. value, 1 : 7 — Agg. value of mixture, 1 : 2
50 ,, ,, ,, chlorinated 5 mins.	,, ,, *Nil* — Coke residue: Hard, black mass, shrunken 5 p.ct.

2—

50 p.ct. Coal A	Agg. value of mixture, *Nil*
50 ,, ,, ,, chlorinated 24 hours	Coke residue, black powder.

INCREASE OF AGGLUTINATING VALUE.

It was realized from the above series of investigations that a coal would be non-coking for one of the following two reasons—viz.:

(*a*) Because of a natural deficiency of agglutinant, or
(*b*) because the condition of the infusible material is such that the inherent agglutinant is absorbed to an excessive extent by the particles of this infusible material so that insufficient (or none) is left to act as a cement during carbonization.

To increase the agglutinating value of a coal, therefore, these two conditions could only be overcome by—

(*a*) addition of agglutinant, or
(*b*) the addition of some material which would act as a diluent of the agglutinant during the period of carbonization, thus reducing the amount of agglutinant absorbed by the infusible material.

It was realized that the nature of the modification of structure taking place in the infusible matter of the coal, to which reference has been made, is such that the reversal of the process could not readily be affected. It is by no means unlikely, however, that this reversal is what actually takes place in such processes as the Sutcliffe-Speakman ("pure coal") pressure briquetting—where the coal is subjected to extraordinarily heavy pressures in order to produce briquettes of high coking value.

The process of addition of agglutinants is quite familiar and has been practised universally for many years. The different agglutinants suggested and covered by patents must number several hundreds.

The second process, however, is not so common, and investigation of this proved rather interesting. Thus it was found that the addition of between 5 p.ct. and 10 p.ct. of substances such as paraffin wax or anthracene oil (which themselves show no agglutinating properties and on carbonization leave practically no residue) increased the agglutinating value of Coal A to 1 : 14 (from 1 : 7) and Coal B to 1 : 22 (from 1 : 13).

Incidentally, it was found during this investigation that the addition of agglutinant would not affect the same increase of agglutination in all cases, particularly when dealing with coals which had been subjected to such treatment as to give them negative agglutinating properties. Thus, the addition of 5 p.ct. of coal tar pitch (a particularly good agglutinant—added to the coal as a suspension in benzene from which the solvent was then removed by evaporation) to Coal A increased the agglutinating value from 1 : 7 to 1 : 12. The alpha-fraction from this coal mixed with 5 p.ct. of pitch still gave a non-coherent "coke," but with 10 p.ct. of pitch a fairly good coke was obtained on carbonization, and the mixture gave an agglutinating value of 1 : 5.

These investigations with regard to the increase of agglutinating properties of coal, and the deductions drawn from them, took place prior to the recent work at H.M. Fuel Research Station on the hydrogenation of coal, to which reference will be made later.

COMPARISON OF INERT MATTER.

The conclusions which have been formed with regard to the influence of the physical state of the infusible coal material on coking properties received considerable support by analogy from a study of various types of inert matter and their influence in the determination of agglutinating value. Among such materials investigated were sand, retort carbon, coke, anthracite, electrode carbon, and "flame-arc" carbon—each from several sources and of various grades. Under exactly similar conditions of determination, these materials with any particular agglutinant gave a large range of agglutinating values. Thus, with Coal A, the values ranged from 1 : 7 to 1 : 65 and with Coal B from 1 : 13 to 1 : 85. An attempt was then made to find some relation between the relative properties of these materials and the agglutinating values which were obtained with them. Briefly, it was ascertained that differences in chemical constitution or in the usually recognized physical properties did not satisfactorily account for the discrepancies in the agglutinating values yielded by these inert materials. Examination of the standard graded powders (60-90 mesh I.M.M.) under high magnification gave a hint that a clue to this search would probably be found if a method could be devised for the determination of the "inspacial volume," or "inspace"—that is, the relative volume of the capillary cavities in the particles of powder—a property obviously associated with porosity or absorptive capacity of the material in the form of powder.

An empirical method was devised for obtaining this value from determinations of:

(A) The apparent specific volume ("bulkspace").
(B) The true specific volume ("matterspace").
(C) The interspacial volume ("interspace")

The inspacial volume (D) was then determined for each of the materials from the equation

$$D = A - (B + C).$$

The results indicate that a definite relation exists between the value D and the agglutinating values given by the series of inert materials. This relation may be roughly represented by:

$$\text{Agglutinating value} \times D = K$$

where K is a constant for each agglutinant used. (The "agglutinating value" figure in the above is the "x" of the value 1 : x). The importance attached to the recognition of this ratio in relation to the conclusions with regard to the function of the infusible coal constituents in coking is apparent.

Incidentally, the fallacy is indicated of using the term "inert" matter in reference to such materials as well as to those used in the determination of agglutinating value.

An indication of the results obtained in this section of the work will be obtained from the following examples (Table 5):

TABLE 5.—*Comparison of "Inert" Materials.*

Agg. Values with . . .	E.C. (1).	E.C. (2).	Calais Sand.
Coal A	1 : 7	1 : 12	1 : 65
Coal B	1 : 13	1 : 19	1 : 85
Inspace (p.ct.) . . .	12·0	7·7	*Nil*

The inspace values given are percentages of the inspace on the bulkspace of unit weight of the 60-90 mesh powders.

E.C. (1) is the standard electrode carbon which was used during these investigations. It has the highest inspace value of all the "inert" materials examined, and because of this was found most suitable in these determinations as giving agglutinating values within a convenient range.

E.C. (2) was obtained as a recovered product from the carbonized residues from the above—*i.e.*, after having been once used for determination of agglutinating value. Its inspace had been

partially filled by carbonized agglutinant, and it consequently (as would be expected) gave considerably higher agglutinating values than the original electrode carbon.

The values for sand are given as exemplifying the results obtained with materials having no inspace and, therefore, giving very high agglutinating values under the conditions adopted in this work.

The agglutinating values of 1 : 65 and 1 : 85 for sand may be taken, as far as practical purposes are concerned, as being infinitely high. Uniformity of mixing is extremely difficult to obtain, and owing to the slow but progressive weakening of the coke residue as the proportion of sand increases and the agglutinating film is attenuated, the end-point of the determination is unreliable.

Similar high agglutinating values and indefinite end-points were experienced with such materials as retort carbon and high-temperature cokes, which in the form of the standard powder were found to have practically no inspace, being composed of glassy, irregularly shaped, apparently fused particles.

The author's observations with regard to the advisability of adopting a definite inert material for use in the determination of agglutinating value, or alternatively the adoption of a suitable agglutinant for standardizing any available inert material, have been outlined in a previous publication[9].

Review of Relevant Publications.

The first three of the following selections from recent publications are interesting as lending support to the conclusions with regard to the ease and readiness with which coal and related materials tend to "defoliate" or disintegrate in physical structure.

Ritter[12], in an examination of the composition and structure of the cell wall of wood, shows that the cellulose and lignin swell to different degrees, and that the swelling of each varies when treated with different reagents—water, acids, and alkalis. During this swelling rupture of the joints occurs between adjacent fibres.

He concludes that the cell wall of wood fibres is composed of several layers which can be separated into fibrils by chemical means.

Hibbert and Parsons[13] have shown that the oxidation of cellulose in neutral, slightly alkaline, and acid solutions "gives evidence of a reaction typical of a heterogeneous system in which there is a progressive degradation of the fibres."

Under certain conditions the degree of disintegration of the fibres may reach the point of the production of a fine powder.

While it is not suggested here that in the case of coal such "cellulosic" disintegration actually takes place, yet there appears to be some analogy between the two classes of similarly constituted materials and their behaviour.

A closer analogy is found in the work of Lea[14], who has studied the "water swelling" of coal. He finds that, on immersion in water, coals expand to varying degrees up to 2 p.ct. (linear) and contract again on drying. This expansion and contraction may be repeated at will, and cause a disintegration of the mass. This movement varies in different directions, is greater at right angles to the bedding plane than along the bands of the coal and varies for the different "Stopes constituents" (vitrain, clarain, and durain) of the same coal. The effect is considerably enhanced by the presence of alkalis and other reagents.

There is little doubt that what we term the "weathering" of coal is contributed to materially by this expansion and contraction of the material, akin to "breathing," which sets up unequal stresses and strains in different directions in each individual piece of coal as well as at points of contact between pieces, and results in a weakening and ultimate disintegration of the physical structure. Apart from manifest disintegration there is modification of the internal structure of the coal, as is evidenced by a distinct change in the "waterproof" qualities of artificially or naturally weathered coal. Fresh, clean coal is notoriously difficult to wet, while weathered coals—and particularly such artificially highly-weathered coals as the chlorinated lump coal referred to previously—absorb water, as well as other liquids, with avidity, tending to produce heavy, sodden masses. One can visualize this avidity, doubtless enhanced by the higher temperature, manifested during the preliminary stages of carbonization, towards the agglutinant, resulting in the absorption of the molten material into capillary recesses to form segregations which would be practically useless from the point of view of enveloping and cementing together the loose particles of the coal mass.

In further reference to this disintegration of the coal mass, Illingworth[15] among other investigators has expressed the view that the action of the various "coal solvents" is a question of the depolymerization of the coal substance. A similar "depolymerizing" action is ascribed by Illingworth to heat treatment alone.

Dr. Tideswell[16] criticizes this "depolymerization" view and advocates the broader conception of "resolution," "simplification," "unbuilding," or "mechanical disintegration" of various morphological entities in the coal (comparable with the loosening or the alteration of the state of aggregation of a colloidal mass).

Prof. Bone, in his book on "Coal and its Scientific Uses" (p. 93), likens the action of the solvent (pyridine in this case) to the removal of the mortar from a structure of bricks and mortar. It is contended here, however, that the action is more vigorous than this analogy would represent, and that the action of solvents, oxidation, and the other pretreatments mentioned is akin to a more or less violent upheaval which not only loosens the joints but shatters the bricks, so that extra binding material is required to remake a firm structure.

Dr. Foxwell[17], in his valuable researches on the "Plastic State of Coal," gives considerable evidence in support of the conclusions expressed in this paper. Though the method of measurement and comparison he employs (by means of the plastic curve) is novel, he is dealing with a property of coal which is obviously closely allied to agglutination. From determinations of the plastic curve of mixtures of coking and non-coking coals, this author concludes that "the extent to which plasticity is developed . . . is not proportional to the amount of coking coal present in the mixture, or to the percentage of gamma-compounds."

He states that he has used coals from South Wales with 2·8 p.ct. and 5 p.ct. of gamma-compounds which yielded very high quality coke, while a Scottish coal with 6·9 p.ct. of gamma-compounds gave a very poor coke. This independence of coking power on the quantity of agglutinant present has been observed and confirmed by several other investigators.

Referring to the results of further investigation, Dr. Foxwell shows that "non-coking coals may reduce the plasticity to a much greater extent than absolutely inert material. It is as if non-coking coals are not merely inert, but have a negative coking power."

Treatment of a highly-coking coal with pyridine without removal of the extract (similar treatment to the one referred to in this paper) gave a product showing only very slight coherence on carbonization, while the plastic curve obtained was that of a non-coking coal.

A highly-coking coal was separated into its alpha, beta, and gamma fractions, and "original" mixtures were made up in which each of the fractions was replaced in turn by powdered coke. In each case the plastic curve obtained was that of a non-coking coal. It was also verified that the washing and drying processes to which the fractions are subjected subsequent to their separation are not responsible for this reduction in coking properties.

It is evident that in quite a number of other authoritative researches on coal this phenomenon of the interference of the infusible matter in the manifestation of coking has been met, though there are seldom attempts to explain it.

Dr. Wheeler, in one of the papers referred to previously[8], concludes that "the resins, and to a certain extent the hydrocarbons, appear to play the part of agglutinating materials, *but it is clear that the character of the infusible part of the coal is of equal importance.*"

The following is a valuable example of an interesting controversy which has arisen owing to the failure to recognize the influence of the infusible material in coking tests.

Prof. Bone (J.S.C.I., 1926, p. 646), discussing criticisms on his own views of the constituents of coal responsible for coking propensities, recapitulates his observations that "Fraction IV." (obtained from the product of the benzene pressure extraction of coal) was found to exhibit considerable binding properties when carbonized at 900° C. in admixture with nine times its weight of dry coke dust. From this and other considerations he claims that the coking propensities of bituminous coals are approximately proportional to their respective yields of this fraction, and concludes, therefore, that this fraction is mainly responsible for the coking of coals. He particularly stresses the fact, however, that from certain other observations it appeared "as though some factor other than the mere intimate association of the chief coking constituents is required to develop the coking propensities of coals," and further that "possibly, also, the character of the benzene-extracted residue may have some influence, though this is as yet uncertain."

Fischer and his collaborators confirm the results of Prof. Bone's experimental observations, but differ from his conclusions with regard to Fraction IV. being the chief cause of coking in coals. These authors, however, instead of using dry coke dust for admixture with Fraction IV., as is the practice of Prof. Bone, employ for the coking tests the pulverized "coal residue" left after benzene extraction. The results of the investigations dealt with in this paper afford a satisfactory solution for the difference in interpretation arrived at by the two investigators.

[12] Geo. J. Ritter—"Composition and Structure of the Cell Wall of Wood." "Ind. & Eng. Chem.," 1928, 20, 941-945. "Fuel," 1929, 296-301.

[13] H. Hibbert and J. L. Parsons—"Oxidation of Cellulose," J.S.C.I." 1925, 44, pp. 473-485T.

[14] F. M. Lea, "Some Physico-Chemical Properties of Coal." "Fuel," 1928, pp. 430-443.

[15] S. Roy Illingworth, "The Action of Solvents on Coal." "Fuel," 1922, 1, pp. 213-219.

[16] F. V. Tideswell, "The Resolution of Coal." "Fuel," 1922, 1, pp. 244-247.

[17] G. E. Foxwell, "The Plastic State of Coal." J.S.C.I., 1921, 40, pp. 193-201T. "Fuel," 1924, 3, pp. 122-128, 371-375.

Considering that the " coal residue " used by Fischer is practically certain to exert negative agglutinating properties, while the coke dust would act as a true inert material (having no inspace, as has been indicated previously), it is not surprising that this difference of interpretation has arisen. In admixture with the " coal residue," Fraction IV. would show very low (if any) agglutinating properties, while with coke dust high values would be obtained.

Incidentally, a useful indication is given here of the necessity for the adoption of a standardized " inert " (or infusible) material and a standard method for the determination of the agglutinating value of coal and related products.

Another instance in which it is considered that this influence of the infusible material has been overlooked is in the observations by Audibert and Delmas[18] on the results of their study of the " Mechanism of Coking " by investigation of the " plastic (fluidity) state." These authors found in the case of Varennes coal that:

(*a*) Swelling of the coal was completely suppressed by preheating *in vacuo* for 4½ hours or by oxidation at 120° C. for 4 hours.

(*b*) Oxidation for 5 hours at 120° C. deprived the coal of its ability to fuse.

The explanation given is that oxidation " involves the transformation of fusible constituents into more refractory substances," and further that " oxidation and preheating both cause chemical changes in coal which alter the manner in which the viscosity changes with temperature."

This assumption of the transformation of fusible constituents does not conform to the results described earlier in this paper in connection with preheating and the stability of these constituents, or with the experiences of other investigators.

Thus, for example, Parr and Hadley[11] carried this investigation of the preheating of coal to a considerably advanced stage. They found that by heating two coking coals (Vermilion County and Williamson County) at 105° C. for 120 hours, the coking power was almost completely destroyed. But the phenol extracts (corresponding to the fusible constituents) of the two coals only lost their high coking properties very slowly on heating at the same temperature, and coking was not completely destroyed even after heating in the former case for 216 hours and in the latter for 242 hours.

In a more recent paper, Audibert[19] gives the results of a most valuable and interesting experimental investigation of the " Mechanism of the Carbonization of Coal." In his conclusions, he contrasts the hypotheses of the two schools of authors of which the one considers coal to consist of both fusible and infusible constituents, while the other, in particular Lierg[20], to whose views Audibert apparently inclines, " maintains that almost the whole of the inorganic matter of coal consists of fusible constituents, and that one must see in the agglomeration that a mass of particles undergoes on heating, not a cementation resulting from the filling-in of voids separating the refractory particles by a fusible adhesive, but a softening affecting the whole mass."

It appears to be extremely difficult to reconcile this view with the complete infusibility of the mass brought about gradually by simple treatments such as have been described or rapidly by more violent treatment and the subsequent extraction from the infusible material of comparatively large amounts of agglutinant.

Incidentally, and *à propos* of another section of this paper, Lierg[21] found that " the residue from the pyridine extraction of a coking coal had lost its coking properties and re-addition of the extract (which was highly coking) did not restore them, but when the extract was dissolved in a solvent and added, the coking property was restored."

On this fact he based a patent claiming that " non-coking coals (' sinter coals ') require 20 to 30 p.ct. of pitch admixed to make good coke, but if the pitch is dissolved in tar oil, 7 to 8 p.ct. suffices."

Mott[22] introduces a new view of coking in discussing the late Sir George Beilby's theory of coke formation[23] wherein the apparent liquefaction of a coking coal during coke formation is related to the theory of surface flow of solids. Mott stresses the " effect of wetting " by the fusible constituents as being an important factor in causing surface flow and the operation of the molecular force of cohesion during the carbonization of coal particles. He states also that variation of coking power by heat treatment is due to a modification of the wetting phenomena involved in the formation of coke; such " wettability of a surface " being influenced by molecular rearrangement or the splitting-off of certain external molecular groupings at the coal particle surfaces where normally a condition of strain obtains.

[18] E. Audibert and L. Delmas, " Mechanism of Coking." " Fuel," 1927, 6, pp. 131-140, 182-189; also " Fuel," 1926, 5, pp. 229-244.

[19] E. Audibert, " Mechanism of Carbonization of Coal." " Fuel," 1929, 8, pp. 225-243.

[20] F. Lierg, " Beitrage zur Chemie des Verkokungsprozesses." Z.f.a.C., 1922, 35, 264.

[21] F. Lierg, 1922. German patent.

[22] R. A. Mott, " A Study of Coke Formation." " Fuel," 1927, 6, pp. 217-231; also J.S.C.I., 1927, 6, pp. 61-98T.

[23] Sir George Beilby, " The Aggregation and Flow of Solids." London, 1921; J.S.C.I. 1922, 41, 341T; also P.R.S., 1903, A72, p. 218.

Here again it appears difficult to conceive that such molecular rearrangement or modification could be brought about by the variety of treatments which have been outlined and which all modify the coking properties in the one direction leading to destruction. Further, the " wetting " theory, implying a purely surface phenomenon, does not appear to go far enough to explain the highly developed absorption powers of the pretreated coals. If a deeper meaning is attached to the term " wettability " than is understood by the conception of a " surface phenomenon," then the theory is in accord with the views advanced in this paper.

BLENDING.

A few remarks must now be made with regard to the important subject of blending. It has been indicated previously in this paper that a coal of high agglutinating properties may have poor coking properties under certain conditions of carbonization.

Thus, where excessive agglutinant is present above the amount required to bind the coking mass into a hard coke, if the coal is allowed to carbonize under the conditions existing in several modern industrial processes of carbonization where the charge is not confined to a constant volume, excessive swelling takes place resulting in a " puffed out," friable coke. The most economical and best method from several points of view of overcoming this excessive swelling is by blending the highly agglutinating coal with a poorly coking coal or with coke breeze.

A considerable amount of work on all aspects of this question of blending has been carried out by a large number of well-known investigators, as is evidenced by the comprehensive and valuable survey prepared and submitted by Dr. King to the recent World Power Conference (1928) Fuel Conference.

To give a simple indication here of the effect of blending, reference need be made to a single example only. In the paper referred to previously by Audibert and Delmas[18], it is stated that, using two coals—a Silesian coal which was quite non-agglutinating and a Lens coal which intumesced to form a spongy, soft coke—the authors obtained, by blending, a series of cokes of crushing strength up to 500 kg. per sq. cm. Similar results were obtained when using up to 25 p.ct. of Kieselguhr or coke instead of the non-coking coal in admixture with the Lens coal.

It is considered that, could laboratory conditions of grinding, intimate mixing in particular, and rate of heating of the charge be copied and economically effected on an industrial scale, considerable advances would rapidly be made in the technical development of blending processes, resulting in the production to a much more satisfactory extent than at present, of coke of any particularly desired properties most suitable for any specific purpose.

Finally, no modern treatise on the coking of coal can be complete without reference to the extraordinarily useful development by Dr. Lander and his co-workers at H.M. Fuel Research Station of the method of increasing the coking power of coals by partial hydrogenation under pressure.

Dr. Lander[24] recently announced that a coal devoid of coking power, when powdered and given " a comparatively mild treatment with hydrogen, came out of the bomb as a hard, pitch-like material which, when carbonized, makes a hard swollen coke. In fact, it gives a hard compact coke if mixed with 2 or 3 times its own weight of the original non-coking coal."

Further, it is stated that a coking coal has been oxidized so as to lose its coking power completely, and has then been hydrogenated back to its original coking power.

It is claimed that even anthracites can be converted into coking coals, and that similar results can be obtained using water gas instead of hydrogen.

As far as can be ascertained, this is the first recorded instance of the artificial production of agglutinant in the coal mass, apart from the probability of this happening to a small extent during carbonization. There is no doubt, particularly in view of the well-known results of further hydrogenation, that a considerable proportion of the coal constituents are metamorphosed by this pressure hydrogenation into quite different chemical entities, at least some of which, as fortunately happens in this case, have particularly valuable agglutinating properties.

As the technique of industrial high-pressure processes is rapidly developing, it appears that the above discovery is destined to have far-reaching effects and to prove of the utmost importance to the future of the coking industry and, therefore, to the general welfare of humanity.

REFERENCES TO COAL IN EXPERIMENTAL SECTION.

COAL A—" Wigan Arley "—a Lancashire coal of good coking power and moderate agglutinating properties.

COAL B—" Mountain Mine "—a Lancashire coal of high agglutinating properties.

COAL C—A mixture of gas coals of medium coking properties from Yorkshire—exact origin and proportion of mixture unknown.

COAL D—" Londonderry "—a Durham highly coking and agglutinating coal.

[24] C. H. Lander, " The Fuel Problem." J.S.C.I., 1928, p. 358.

RECONSTRUCTED GAS-WORKS AT OSWALDTWISTLE.

Inspection of New Gasholder and Other Extensions.

A few years ago the Members of the Gas Committee of the Oswaldtwistle Council decided that the reconstruction of their gas-works was urgently necessary to meet present-day requirements; and the work of re-building was at once commenced. On Wednesday, July 10, they celebrated the completion of their scheme, when a number of gas engineers and managers from neighbouring towns were invited to inspect their new spiral gasholder, offices, and works generally.

The visitors were welcomed by the Chairman of the Gas Committee, Councillor T. Scholes, and the Gas Engineer, Mr. A. F. Ames, and were later conducted round the works.

In 1924, the carbonizing plant was inadequate to meet the increasing demand for gas. A new retort house with horizontal retort settings, storing machine, coal and coke handling plant, and electricity generating plant was therefore erected in 1925. The gas consumption had increased from 57 million c.ft. in 1908, when the plant was first reconstructed, to 114 millions in 1925. In addition to extensions to plant, many works improvements have been carried out during the past four years, including new general stores, coal stores, boundary and retaining walls, concrete purifying floor, offices, weigh-bridge, &c. A laboratory, equipped with calorimeters, pyrometer, and other apparatus to enable the necessary technical control and supervision of the plant to be effected, now forms part of the new offices.

THE WORKS AS RECONSTRUCTED.

The Works are situated in the Urban District of Church, on the main road from Church to Blackburn. All coal is carted from the Railway Company's sidings (about 200 yards from the Works) and is tipped into a 30-ton hopper, whence it passes through a breaker and is carried by a bucket elevator to a conveyor, and is deposited into bunkers, situated over the retort settings, capable of holding 48 hours' supply.

The retort bench comprises four settings of eight retorts, in four tiers of two each. The retorts are 20 ft. long by 24 in. by 18 in. section. They are built up from silica segments. The capacity of the plant is 675,000 c.ft. of gas per day, and was erected by Messrs. Drakes, Ltd. The retorts are charged and discharged by means of a Drakes combined stoking machine.

The coke is discharged into a Drakes electrically driven coke bus, which traverses the front of the settings. The coke is quenched and tipped into the yard or into a hopper, whence it passes through a breaker. It is then raised by means of a bucket elevator to a set of Drakes patent "Cascade" screens, where it is graded, and stored in overhead bunkers. The coke is delivered from the bottom of these bunkers into vehicles, and bagging chutes are also provided.

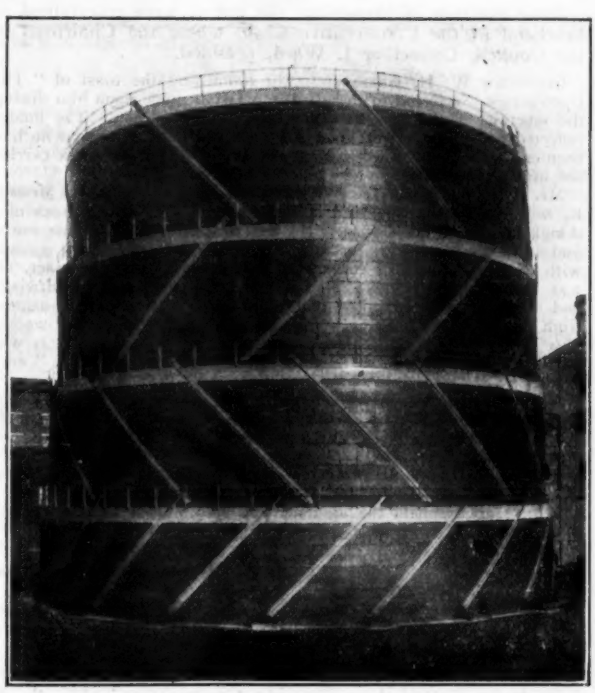
The coal handling, charging, and discharging machine, and the coke handling plant, are driven by D.C. electric motors, the power being generated by a 30-KW. generator working at 640 R.P.M. driven by a 50-B.H.P. "National" gas engine.

A Livesey washer is provided for the extraction of tar, and a tower scrubber and a Holmes rotary washer-scrubber for ammonia extraction. The meter house contains a Braddock water-drum type meter, to register up to 30,000 c.ft. per hour.

NEW GASHOLDER.

The new gasholder is erected in the existing brick and puddle tank. New rest blocks, with concrete foundations, were provided, and additional holding down bolts fixed. The holder has four lifts on the spirally guided type, of the following dimensions: Outer lift, 92 ft. diameter; third lift, 89 ft. 5 in.; second lift, 86 ft. 10 in.; inner lift, 84 ft. 3 in. All the lifts are 22 ft. deep, and the crown has a rise of 4 ft. 6 in. from the curb to the centre. The inner lift is weighted to give 6 in. pressure; the total pressure of the four lifts being 14¾ in.

The holder embodies all the latest improvements. The circular rings of angle iron forming the bracket bars are laid upon the roof framing, to support the crown plating. All the vertical stays have the upper ends bent and secured to the under-



The New Holder by Messrs. R. & J. Dempster.

side of the dip channels, to prevent tilting; they are also extended at the foot and bracketed to the underside of the cup channels. Provision is made upon the upper and lower sheets, by means of a triangular projection, to receive the ends of the spiral plates, thereby avoiding the thinning of the plated and lap joints at curbs, cups, and dips. The upper edge of the top row of plates on the various lifts is extended above the curb and dips, to protect the painting; while suitable handrails and stands are also fixed around each dip and the crown. The guide rollers are of the "Bearscot" all-steel, four-roller type, and all the dip carriage rollers are linked in pairs. The holder is fitted with run-down stops, and provided with anti-freezers;

and ladders are fixed to each lift. The capacity is 500,979 c.ft., and it replaces a two-lift of the column-guided type of 275,000 c.ft. capacity. The contractors for the demolition of the old holder and the erection of the new holder were Messrs. R. & J. Dempster, Ltd., of Manchester.

Two Braddock station governors, a 12-in. and a 10-in., control the supply of gas to the district. A Bryan-Donkin horizontal steam engine and compressor is used to spray paraffin into the gas, to assist in preventing deposits of naphthalene.

Offices and Showrooms.

The new offices are at the entrance to the works, and, in addition to provision for the staff and management, include drawing office and laboratory.

The showrooms are situated in Union Road, in the centre of the town, and were opened in 1927; and an illustrated account of them was published in the "Gas Salesman" for Jan. 12, 1927.

There are 21 miles of mains, and the gas appliances in use number 7500. Over 70 p.ct. of the houses are equipped with gas cookers. There are 3780 consumers, the average yearly consumption per consumer being 31,300 c.ft. The average price received for gas is 3s. 1d. per 1000 c.ft., or 7·7d. per therm. The following scale of charges is now in force:—

	Price per Therm. d.
Ordinary meters (domestic)	7·5
Prepayment meters	8·8
Trade consumers—	
Up to 1200 therms per month	7·5
Over 1200 therms per month	7·1
Power consumers—	
Under 240 therms per month	5·85
240 therms to 480 therms	5·65
480 therms to 720 therms	5·35
720 therms to 1200 therms	5·15
1200 therms to 1440 therms	4·55
1440 therms to 2160 therms	4·00
Over 2160 therms per month	3·85

There are 390 street lamps fitted with clockwork controllers, and the Gas Department are responsible for the public street lighting, and during the past four years have been called upon to bear the cost of such service, approximately £1450 per annum.

Luncheon Speeches.

After the tour of inspection, the guests were entertained at luncheon at the Conservative Club, where the Chairman to the Council, Councillor J. Ward, presided.

Councillor W. H. Greenwood, in submitting the toast of "The Contractors," referred to the good impression made upon him during the erection of the new gasholder by their workmen. The holder reflected very great credit upon the firm and the workmen who had been engaged upon the work. He also spoke well of the work carried out in the erection of the new offices by Messrs. Walsh.

Mr. J. W. Scott, who was the first to respond on behalf of Messrs. R. & J. Dempster, Ltd., said it was very pleasant to hear such nice things said about one's work. He was as keen a critic as one would find in connection with gasholder work, and he was very pleased with the way the firm's employees had carried out the contract. It was interesting to be associated with such a town as Oswaldtwistle and Church; and he noted that the Board took over the business from the original Company at the actual cost of erecting the works, *plus* interest at 5 p.ct. This was in 1869, yet in those days gas was sold on a sliding-scale, so that the Council were "up-to-date" even then.

Mr. A. Walsh, the contractor for the new offices, said he was happy to have some little part in the re-modelling of the gas-works. He felt that they now had a gas-works which was up-to-date and efficient, and which was being extremely well managed.

Mr. A. J. Harrison, Manager to the Accrington Gas and Water Board, proposed the toast of "The Oswaldtwistle Gas Department." "I have always held the opinion," he said, "that local governing bodies should set an example in the design, the construction, the orderliness, and the cleanliness of the different undertakings under which they have control. It must be, Mr. Chairman, to you and your Committee, a pleasure, as it has been to us visitors, to note what I can only fittingly describe as the general tone in your gas-works. It is certainly a very high standard and reflects the greatest possible credit upon you and your Committee and your Engineer."

Supplying Cheap Gas.

But, apart from having a clean, orderly, and well-managed works, they had accomplished something else in Oswaldtwistle. They had for many years, and were to-day, supplying a very cheap gas—a very cheap form of light, heat, and power for their industries and for the domestic use of their townspeople. At such low rates they were doing a great deal to enable their trades to manufacture their commodities as cheaply as possible, and they were doing a fair share towards relieving domestic drudgery. Cheap production, however, was not everything; and recognizing that, they had, he believed, a very efficient system of maintenance—a system which was keeping in close touch with their consumers by means of well-equipped showrooms and a good maintenance staff.

The Undertaking's Growth.

Councillor Scholes, in reply, said that during the five years that he had been Chairman of the Gas Committee a great many alterations and improvements had been carried out, and he thought they could now say they had a thoroughly up-to-date and efficient plant, and practically a new works. It was realized five years ago that a great deal of money would have to be spent on new plant, particularly as the old retort settings were in a bad condition, and it was with difficulty that the supply of gas was maintained. A new retort house, complete with horizontal carbonizing plant, and coal and coke handling plant, was erected and put to work in 1925, and had given excellent results. After dealing with further improvements, Mr. Scholes said that in 1927 it was realized that extensive repairs were needed to the existing column-guided gasholder if it was to be put into a safe condition, as it was badly worn and corroded. However, it was decided that it would be a better proposition to replace the holder with a new one of practically double the capacity, as the storage was not equal to a 24 hours' supply in winter. Messrs. R. & J. Dempster, Ltd., had carried out the work to their entire satisfaction. The storage capacity was now 670,000 c.ft., and the maximum day's consumption was 604,000 c.ft. It was also decided to build new offices to replace the old inadequate buildings, and Messrs. G. Walsh & Sons, Ltd., had had charge of that work.

The Financial Side.

A great deal of work had been done in re-laying old and defective mains and services, and the distribution system was now in first-class condition. They had also some of the finest showrooms for the size of the town in the country, and during the past four years 2084 appliances of a cash value of £10,000 had been sold. Mr. Scholes dealt in detail with the financial side, and said contributions to the relief of rates during the past four years amounted to £5226. The sales of gas had doubled during the past twenty years, while during the past five years they had had an increase of 20 p.ct.

Councillor R. Dawson, Chairman of the Finance Committee, proposed the toast of "The Visitors.

An Efficient Works.

Mr. W. B. McLusky, Engineer and Manager to the Halifax Gas Department, in reply, said that Oswaldtwistle had always had a name for cheap gas; and during the past few years they had not only shown people how to make gas at a low price, but they were also continuing to sell at a low price, which was a very different thing. The Council appeared to him not only to be very economical, but to be very enterprising; and he could tell them from his own practical experience that in the country to-day the cheapest gas was made in the smallest gas-works. They could not deny that when they got a small District Council like theirs with a Manager who could devote all his time to his job, they would find that almost invariably the results of those small gas-works would put big gas-works to shame.

Mr. J. H. Clegg, of Burnley, also responded.

Councillor Heys proposed a toast to the Gas Manager (Mr. Ames) and to the Surveyor for the work they had done; and Mr. Ames suitably responded on behalf of himself and Mr. Shorrock.

Concrete for Design.

Writing on the subject of "Concrete for Design" in the current issue of "Modern Building Construction," Mr. A. R. Sykes, D.S.O., M.C., B.Arch., A.R.I.B.A., states that the fact that the modern school of design has seized upon concrete as a medium for the expression of new forms and principles gives an impression to the less sophisticated public that the peculiarities of form often expressed are the direct outcome of the use of concrete, rather than the result of a philosophy which is supposed to answer new and modern needs of human life. The appearance of buildings which are frankly claimed to be "contrivances to live in," rather than homes, may be theoretically interesting, but they can never make more than a fashionable appeal to the few among a majority who would rather exclude the mechanical tendencies of the present day from their homes, than have them expressed in their daily life. However stimulating modern poetry, modern painting, and modern architecture may be to those whose interest it is to study and understand them, they can only usurp the claims of traditional form to a limited extent provided that the latter is used with any sort of creative genius. Bad periods of (traditional) architecture have led the modernists to decry uninspired traditional work as dead and meaningless, and as a protest consciously to invent shapes which are in contradiction to what we have been accustomed. Admittedly, men of great creative genius have been the pioneers in this movement, but, as always happens, men of lesser ability seize on the forms without understanding their basic ideas, with the result that much of the architecture therein expressed is a "stunt" worthy of cinema studios, but without serious architectural significance. It is, however, rather unfortunate that having recovered from the early experimental stages of grim concrete houses, the latest expression of this extremely accommodating structural material should be recognized by exotic and often irritating forms.

NOTES ON NEW BOOKS.

CONSTRUCTION AND OPERATION OF GAS-WORKS.*

Reviewed by H. M. SPIERS, M.A., B.Sc., F.I.C.

The appearance of the fourth edition of a treatise which for many years has been the standard German book on gas-works practice is very welcome; the more so since the industry has made extraordinarily rapid strides within recent years, and since the previous edition, which was, of course, essentially sound on the basic principles which do not alter with the lapse of time, has been out of print for several years.

In its presentation of the intricacies governing the manufacture of town gas and the bye-products normally produced in gas-works, the book is, in general, remarkably complete and, as this statement implies, up-to-date to an unusual degree. The copious footnotes contain a multitude of references to papers published during the last three years, and even a few references to work published as recently as 1929. In his treatment of the subject, the author adopts a critical attitude, and does not content himself with a mere description of plant and process. The text is amplified by the inclusion of numerous illustrations, of which there are almost five hundred, and the type and paper leave nothing to be desired.

The work is divided into eighteen main sections as follows: Bituminous Coals; Combustion; Carbonization Plant; Coke; Gasification; Cooling; Exhausters; Tar Extraction; Naphthalene; Benzole Recovery; Ammonia Scrubbers; Ammonia Recovery; Purification; Station Meters; Gasholders; Governors; Heat Economy; Plant Control. The treatment, where plant is concerned, includes a survey of the various types of plant available, an explanation of the physical and chemical principles involved, and a description of the analytical methods employed in the control of the plant. Separate sections are devoted purely to chemical and physical methods of analysis and measurement —e.g., the analysis and evaluation of coal, tar, gas, &c., and the measurement, for example, of pressure, temperature, specific gravity, and calorific value both by manipulative as well as by automatic methods.

Comprehensive though the treatise is, there are several topics of importance which are not included, and no reference is to be found to coal blending, gas drying, Connersville meters, insulation of settings, low-temperature processes, or water softening. On the other hand, recent innovations such as waterless gasholders, complete gasification, dry quenching, liquid purification, and the production of neutral sulphate of ammonia are described.

Throughout, there is noticeable the tendency towards the adoption of ideas conducive to economy in labour and in the fuel required for carbonization. In this connection, the development of the large vertical chamber oven carbonizing 11 tons per day is of especial interest. This is paralleled in England by continuous vertical retorts of similar capacity, but the gas-works of this country have not yet brought into use horizontal ovens or coke ovens which can handle 20 tons of coal per twenty-four hours, though their introduction is imminent. The selection of carbonizing plant necessitates, however, the consideration of other factors besides those just mentioned, and due consideration must be given to local conditions. As regards producers, it is to be noted that external producers seem to have attained a considerable degree of popularity.

The author is much concerned over the drawbacks attending dry purification by the standard iron-oxide process, and looks forward to the time when this method will give place to one more economical and less troublesome. No little ingenuity has been exercised in the devising of suitable alternative methods, both dry and liquid, but so far without complete success, since, in general, purification is not quantitative, and final purification must be effected by use of a certain number of oxide boxes, with the result that the net saving is of doubtful significance. The Raffloer process, in which purification is effected by the agency of ferric oxide suspended in fine form in the gas, is regarded as a promising one, since the installation costs are said to be very considerably less than are those of an oxide box system. The author expresses the hope that this process may turn out to be as promising as it seems to be; but here, also, purification is apparently not complete, since the statement is made that the existing purifying system may, as a safety measure, serve to complete the purification.

The section on ammonia recovery is particularly good, reference being made to modern processes such as those of Cobb and of Burkheiser, as well as to the methods more commonly employed. The ammonium bisulphite process devised by the last-named is regarded by the author as a very promising one, provided that various technical difficulties, still outstanding, are overcome.

The section on tar is somewhat disappointing. No description is given of tar distillation plant, though brief reference is made to a few types of stills. Also no mention is made of the differences in the composition of tars produced by the various carbonizing systems. However, the writing of a well-balanced treatise dealing with the complicated assembly of plant required in a modern gas-works, and with the chemical, physical, and thermal principles involved in the various processes, is a formidable task—the more so by reason of the wide variety of equipment available for each type of operation—and the fact that some aspects are treated less fully than are others may readily be pardoned. To do full justice to the subject, a much larger treatise and the collaboration of a number of experts would be required. One very important desideratum is that illustrations should depict the latest type of plant. This has, however, not always been achieved, though manufacturers would doubtless willingly have co-operated with the author in this matter. It remains but to add that errors, though present, are comparatively few in number.

Those of our readers who are familiar with German will find much of interest in the work.

* "The Construction and Operation of a Gas-Works." (Einrichtung und Betriebs eines Gaswerkes), by A. Schäfer (with the collaboration of E. Langthaler); 4th Edition. (Munich and Berlin, 1929. R. Oldenbourg; pp. XIV. + 805.)

THE NEW COMPANY LAW.*

The author of this book, Mr. Herbert W. Jordan, is well known as a lecturer in Company Law and Practice, and as an author of a number of text-books on that subject; and he closely followed the passage of the recent Company Acts through Parliament. His latest work deals with the Companies Act, 1929, and has been prepared to show the principal changes in the law. It is divided into two sections, the first of which states the amendments of which directors and officers of private companies should be cognizant, while the second states the amendments exclusively affecting public companies. The book is not concerned with the merits or demerits of the new Act, but the author records his opinion that, except in rare instances, experience of its working will allay any apprehension. Undesirable practices, he states, will certainly occasion greater risks, and detection of fraud will be easier. He thinks that the fear that the Act will lead to abundant litigation is not well founded. The book does not deal with the provisions of the Act which exclusively affect Scotland.

* "The New Company Law, as it affects (*a*) Private Companies, (*b*) Public Companies," by Herbert W. Jordan. Published by Jordan & Sons, Ltd., price 4s., post free. [Bound with the King's Printers Copy of the Act, price 9s., post free.]

Irish Association of Gas Managers.

The annual meeting of the Association will be held in Jury's Hotel, Dublin, on Aug. 13, under the Presidency of Mr. L. W. Dalby, of the Wicklow District Gas Company. The proceedings will commence with the President's Address; and there will be a paper on "Salesmanship," by Mr. W. H. Ainsworth, of Manchester, and a debate on problems of particular interest to Irish gas managers. During the afternoon there will be a meeting of the Irish District Executive Board of the National Gas Council, when the chair will be taken by Mr. J. D. Smith, of Belfast. Mr. E. J. Fottrell, Joint Manager of the British Gas Council, and Mr. W. M. Mason, Manager of the British Commercial Gas Association, will give a review of the work accomplished by these bodies during the past year. On Aug. 14 there will be an excursion to Glendalough.

British Standard Specification for Turpentine.—A British Standard Specification (No. 290-1929) for Turpentine, Type 2, has just been published by the British Engineering Standards Association. This Specification is yet another of the comprehensive series of Standard Specifications for paints, varnishes, and paint ingredients published by this Associaton, and covers turpentine distilled from pine oleo-resins and from resinous wood by steam or destructive distillation. An earlier Specification published in 1926 (No. 244-1926) deals with Turpentine, Type 1, which covers American gum spirits or spirits of turpentine. The Specification now published contains clauses covering specific gravity, distillation, residue, refractive index, polymerization, and flash-point; and appendices are added giving a standard method of distillation and polymerization test. Copies may be obtained from the British Engineering Standards Association, Publications Department, 28, Victoria Street, S.W. 1, price 2s. 2d., post free.

AFTER-EXPANSION AND TRUE SPECIFIC GRAVITY OF SILICA REFRACTORIES FOR CARBONIZING PLANT.

By A. J. DALE, H. T. S. SWALLOW, and F. WHEELER.

From the 1929 Report of the Refractory Materials Joint Committee of the Institution of Gas Engineers and the Society of British Gas Industries.

PART I.

Foreword.—For some time the Refractory Materials Committee of the Institution of Gas Engineers has considered whether the standard test and specification for the "After-Expansion" of silica refractories is sufficiently stringent to meet existing circumstances in the gas industry.

In its present form, the specification demands, of silica products, that test-pieces, 2½ in. to 3 in. long by 1½ in. to 2 in., by 1½ in. to 2 in., when heated to a temperature of 1410° C. (approximately Cone 14) and maintained at that average temperature for two hours shall not show an after-contraction or expansion of more than 0·5 per cent., a tolerance of 0·1 per cent. being allowed for experimental error.

With the extended application of silica work in combustion chamber, cross-wall and retort construction, combustion chamber temperatures of around 1450° C. are frequently adopted and temperatures of 1350° C. are of common occurrence. In fact, the pyrometric records of flue temperatures of certain vertical installations indicate that peak temperatures of 1470°, or even higher, are at times attained.

In these circumstances, then, the question has arisen as to whether a two-hours' heat treatment at 1410° C. is sufficiently severe for the "after-expansion" test on silica products intended for gas-works usage. Is not 1500° C. a more reasonable testing temperature, and, if so, what limit should a modified specification define for "after-expansion" at this temperature? The present report attempts to provide some measure of reply to this problem.

The Fundamental Causes of "After" or Permanent Expansion.—Before proceeding to a consideration of available experimental data, it seems desirable to include a few remarks on the actual cause of "after-expansion" in silica materials.

Generally speaking, the original mixture from which a silica brick is compounded contains 98 per cent. of quartzitic particles of various sizes and 2 per cent. of lime or other bonding agent. Quartz itself, the main initial constituent, has a specific gravity of 2·65, but during the heat treatment to which the bricks are subjected in the kiln, the quartz slowly alters or converts to other varieties of silica with a specific gravity of around 2·33. Such a conversion is, of course, attended by a corresponding increase in volume, but it should be appreciated that the quantitative increase in volume is dependent on:

(*a*) *The maximum soaking temperature obtained in the kiln.*—As was shown previously by one of us, with one variety of silica brick the rate of conversion (or expansion) at 1350° C. was twice as great as at 1250° C.; at 1450° C. the velocity of conversion was six times, and at 1550° C., twenty-six times as great as at 1250° C.

(*b*) *The duration of the heat treatment.*—Generally speaking, the rate of conversion at any temperature gradually decreases as time proceeds. At moderate temperatures, say 1200° C., the rate of conversion is slow and an extended heat soaking is necessary before anything approaching complete conversion is attained. At high temperatures, circ. 1500° C., conversion rate is extremely high with most types of quartzites, and the expansion associated with this conversion rapidly approaches completion.

(*c*) *The Size and Specific Nature of the Quartzitic Particles.*—Generally speaking, and other factors being equal, the rate of conversion increases with decreasing particle size. Additionally, quartzites of different origin and physical constitution convert at different rates.

The above points have been mentioned and briefly discussed since they have a very direct bearing on the present consideration.

The True Specific Gravity and After-Expansion of Silica Refractories at 1410° C.—For the past few years, the after-expansion test on silica refractories has been effected at a testing temperature of 1410° C. At occasional times, various measurements of the after-expansion at 1500° C. have been made, and prior to standardization of 1410° C. as the testing temperature, a few results obtained at Cone

TABLE I.

—	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Silica	95·40	95·47	94·07	95·15	94·67	94·57	92·73	95·62	95·10	95·40	95·19	95·83	95·87	95·16	93·02	92·59	95·33	96·73	95·06	94·76
Titanic oxide	0·41	0·27	0·19	0·27	0·16	0·15	0·29	0·16	0·34	0·26	0·18	0·14	0·18	0·31	0·38	0·41	0·14	0·18	0·29	0·21
Lime	1·84	1·58	2·86	1·81	1·94	2·21	3·28	1·51	1·59	1·61	1·96	1·88	2·04	1·71	1·84	1·92	1·47	1·58	1·86	1·98
Magnesia	0·16	0·12	0·31	0·21	0·19	0·17	0·31	0·18	0·09	0·12	0·16	0·21	0·18	0·21	0·31	0·46	0·19	0·23	0·19	0·21
Alumina	0·74	1·06	1·02	1·21	2·18	1·84	1·71	1·02	0·91	0·88	1·02	1·14	0·71	1·06	2·14	2·28	0·91	1·01	0·91	0·90
Ferric oxide	6·81	0·74	0·81	0·91	0·41	0·39	0·81	0·74	1·02	0·94	0·81	0·91	0·51	0·81	1·06	1·12	1·03	1·18	0·92	1·01
Alks.	0·51	0·61	0·51	0·36	0·57	0·61	0·81	0·61	0·71	0·61	0·58	0·71	0·49	0·54	1·02	0·96	0·51	0·61	0·71	0·74
Loss on ignition	0·07	0·06	0·11	0·04	0·06	0·04	0·12	9·04	0·08	0·08	0·06	0·04	0·04	0·06	0·14	0·14	0·06	0·06	0·08	0·09
Total	99·94	99·91	99·88	99·96	100·18	99·98	100·06	99·88	99·84	99·90	99·96	100·06	100·02	99·86	99·91	99·88	99·91	99·98	100·02	99·90
True Sp. Gr.	2·32	2·32	2·30	2·32	2·33	2·33	2·28	2·33	2·33	2·33	2·33	2·33	2·34	2·34	2·34	2·34	2·35	2·35	2·36	2·36
Appt. Sp. Gr.	1·71	1·74	1·64	1·65	1·61	1·61	1·54	1·68	1·71	1·74	1·78	1·62	1·63	1·71	1·68	1·76	1·78	1·71	1·70	1·71
Texture	F	M	F	M	F	M	F	M	M	M	F	M	M	F	M	M	F	M	M	C
Porosity, per cent.	26·20	25·00	28·70	28·80	30·80	30·80	32·40	28·00	26·60	25·20	23·60	30·50	30·30	26·90	28·20	24·80	24·20	27·50	28·00	27·50
Linear after-expansion, per cent.	0·10	0·08	0·08	0·18	0·20	0·06	0·06	0·11	0·30	0·32	0·16	0·22	0·40	0·20	0·30	0·10	0·40	0·48	0·50	0·56

—	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Silica	95·45	94·39	95·50	95·97	94·87	94·76	94·59	95·56	94·62	94·48	94·29	95·24	96·46	94·65	94·97	95·05	95·18	94·70	95·72	93·33
Titanic oxide	0·19	0·22	0·19	0·09	0·21	0·19	0·14	0·21	0·17	0·27	0·16	0·13	0·11	0·18	0·29	0·21	0·39	0·19	0·09	0·24
Lime	2·01	1·81	1·71	1·64	1·12	2·02	1·81	1·42	1·92	1·86	1·78	1·80	1·64	0·71	1·81	1·86	1·84	2·04	1·71	1·69
Magnesia	0·19	0·31	0·29	0·14	0·21	0·23	0·17	0·12	0·18	0·17	0·17	0·20	0·21	0·18	0·19	0·18	0·16	0·21	0·14	0·21
Alumina	0·71	1·84	1·02	0·91	1·94	1·08	1·16	0·86	0·91	1·21	1·46	1·02	0·64	1·04	1·12	1·08	0·76	0·91	0·86	1·86
Ferric oxide	0·66	0·71	0·58	0·61	0·81	0·88	1·02	0·74	1·14	1·04	1·31	0·86	0·61	2·36	0·91	0·71	0·11	1·21	0·81	1·32
Alks.	0·71	0·41	0·49	0·51	0·86	0·61	0·81	0·91	0·71	0·81	0·87	1·58	0·45	0·61	0·56	0·69	0·58	0·61	0·91	1·01
Loss on ignition	0·06	0·11	0·13	0·09	0·12	0·13	0·14	0·09	0·16	0·14	0·12	0·09	0·09	0·18	0·09	0·18	0·09	0·09	0·10	0·21
Total	99·98	99·80	99·91	99·96	100·14	99·90	99·84	99·91	99·81	99·98	100·16	99·92	100·21	99·91	99·94	99·96	99·91	99·96	100·14	99·87
True Sp. Gr.	2·37	2·37	2·38	2·39	2·39	2·39	2·40	2·40	2·41	2·41	2·43	2·43	2·43	2·45	2·45	2·46	2·47	2·47	2·48	2·48
Appt. Sp. Gr.	1·69	1·69	1·75	1·74	1·71	1·69	1·61	1·75	1·74	1·66	1·81	1·78	1·75	1·68	1·76	1·68	1·81	1·76	1·84	1·80
Texture	F	C	M	M	M	C	C	M	C	M	C	C	M	F	C	F	C	C	C	M
Porosity, per cent.	28·70	28·70	26·50	27·20	28·40	29·20	32·90	27·10	27·80	31·10	25·60	26·70	28·00	31·40	28·10	31·60	26·70	28·70	25·80	27·40
Linear after-expansion, per cent.	0·68	0·80	0·74	0·78	0·86	1·08	1·00	1·18	1·00	1·10	0·80	1·48	1·60	1·80	1·00	1·84	1·00	1·40	2·30	2·60

F—Fine texture. M—Medium texture. C—Coarse texture.

TABLE II.

Mark.	Silica Bricks. Analysis. SiO_2	Al_2O_3	Fe_2O_3	CaO	K_2O	Na_2O	Loss.	Data on After-Expansion and Specific Gravity Tests. After-Expansion.	True Specific Gravity.	Apparent Specific Gravity.	Porosity.	Ordinary Refractoriness.	Under Load Refractoriness.
								Per Cent.					
A	89·43	5·16	1·50	0·49	0·88	0·54	0·27	0·23 Cone 14	2·46	1·55	..	..	..
,,	95·24	1·34	0·34	2·19	0·32	0·54	0·32	0·07 ,,	2·41	1·81	..	..	..
,,	93·91	1·28	0·87	1·93	0·50	0·58	0·14	0·15 ,,	2·41	1·76	..	..	..
,,	93·50	2·37	0·56	2·64	0·30	0·20	..	0·11 ,, 6 0·23 ,, 14	..	..	..	Cone 32	..
,,	94·38	1·96	..	1·90	1·30		..	..	2·31	..	..	..	Cone 29
,,	..	..	..	..	..		..	0·08 Cone 14	2·34	1·86	20·51	..	..
,,	94·84	1·40	0·70	2·33	0·64		..	0·10	..	..	..	..	Cone 31
,,	..	..	..	..	..		..	0·067	..	..	..	..	Cone 30–31
,,	94·96	1·09	0·85	2·35	0·83		0·11	0·25	..	..	..	Cone 31	..
,,	94·68	1·90	0·68	2·12	0·32	0·38	0·09	0·20	..	..	..	Cone 32–33	..
,,	92·24	2·43	0·56	2·90	0·21	..	0·15	0·11	2·37	1·58	..	Cone 30–31	..
,,	93·50	2·29	0·65	2·06	0·62	0·54	0·12	0·10	2·44	1·73	29·10	Cone 31	..
B	..	..	..	..	..		..	0·06 Cone 12	2·35	1·58	32·80	Cone 31–32	..
,,	..	..	..	..	..		..	0·33 ,,	2·37	1·62	31·70	Cone 31–32	..
,,	..	..	..	..	..		..	0·14 ,,	2·41	1·71	29·05	Cone 29	..
,,	..	..	..	..	..		..	0·33 ,,	2·37	1·76	25·74	Cone 31	..
,,	..	..	..	..	..		..	0·06 ,,	2·37	1·70	28·30	Cone 30–31	..
,,	..	..	..	..	..		..	0·28 Cone 14	..	..	..	Cone 31	..
,,	94·54	2·93	0·53	1·35	0·70		..	0·10 ,,	..	..	..	Cone 31–32	..
,,	..	..	..	..	..		..	0·15 Cone 12	2·48	1·71	28·43	..	..
,,	..	..	..	..	..		..	0·03 ,,	2·30	1·65	28·20	..	..
,,	..	..	..	..	..		..	0·06 ,,	2·35	1·58	32·80	Cone 31–32	..
C	94·98	3·85	0·78	2·04	0·16	1·01	0·27	0·29 Cone 14	2·31	1·70	25·11	Cone 31–32	..
D	93·81	..	..	..	..		..	0·22	2·52	1·64	34·93	Cone 32	..
E	90·80	2·00	1·96	3·68	0·18	0·74	0·14	0·62	2·49	..	..	Cone 30	Cone 17–18
F	93·38	2·65	0·82	1·54	0·26	0·13	0·32	0·03	..	..	..	Cone 32	..
G	93·84	1·31	0·63	3·04	0·56	0·24	0·22	..	..	..	..	Cone 32–33	..
,,	..	..	..	..	..		..	0·05 Cone 12	2·40	..	..	Cone 33	..
H	..	..	..	..	..		..	0·14 1500°	..	..	..	Cone 31	..
,,	..	..	..	..	..		..	0·24 0·73 ,,	..	..	..	..	..
,,	..	..	..	..	..		..	0·00 1410°	..	..	..	..	..
,,	..	..	..	..	..		..	0·33 1480°	2·33	..	..	..	..
,,	88·91	..	..	..	..		..	*Nil*	..	..	..	..	Cone 20–26
,,	..	..	..	..	..		..	0·14 1400°	..	..	..	..	..
I	..	..	..	..	..		..	1·11 1500°	..	..	..	..	..
,,	..	..	..	..	..		..	0·10 1410°	..	..	..	..	..
,,	..	..	..	..	..		..	0·17 1500°	..	..	..	..	..
,,	..	..	..	..	..		..	0·22 Cone 14	2·36	1·47	37·70	Cone 32	Cone 26
J	..	..	..	..	..		..	0·12 ,,	..	..	..	..	..
,,	..	..	..	..	..		..	0·16 ,,	..	..	..	..	..
,,	94·54	0·33	1·55	2·18	0·68		..	0·18 ,,	2·33	..	..	..	..
K	93·48	4·09	0·42	1·06	..		..	0·59 ,,	..	..	..	..	..
L	..	..	..	..	..		..	0·08 ,,	2·34	1·86	20·51	..	..
M	..	..	..	..	..		..	0·12	2·37	1·75	26·17	Cone 30	..
N	92·72	1·58	..	2·30	..		..	0·03	2·33	1·48	36·48	Cone 31–32	..
O	..	..	..	..	..		..	0·15 Cone 14	2·35	1·89	19·58	..	Cone 32

12 (approximately 1350° C.) were recorded. A selection of these data is shown in Table I. (W. J. Rees), Table II. (J. W. Mellor), and Table III. (T. F. E. Rhead and R. E. Jefferson).

From the figures formulated in Table I., the following inferences relating true specific gavity with "after-expansion" would appear justifiable:

(*a*) For lime-bonded silica bricks of medium and fine texture, there is practically a linear relation between true specific gravity and amount of "after-expansion" at 1410° C.

(*b*) Irrespective of texture, all silica bricks with a specific gravity greater than 2·36 show after expansions in excess of 0·5 per cent., and therefore fail to satisfy the requirement of the present specification.

However, reference to the results placed at our disposal by Dr. J. W. Mellor will show that the second of these inferences is by no means generally true. In Table II. several silica bricks with a specific gravity of more than 2·36 show after-expansions less than 0·5 per cent. with the degree of tolerance allowed by the specification.

Hence, the rule, if any, should read:

> "Silica bricks having a specific gravity of, or less than, 2·36, will conform with the demands of the present specification, and will show an after-expansion of less than 0·6 per cent. when heated at 1410° for two hours. Silica bricks with a specific gravity of greater than 2·36, may or may not pass the standard test."

The results of T. F. E. Rhead and C. E. Jefferson, Table III., record the effect of time on the after-expansion of a silica brick at a temperature of approximately 950° to 1000° C. The brick contained 96·5 per cent. SiO_2. It will be noted that at this testing temperature, permanent expansion continued over a protracted time interval, 1000 hours. However, it should be mentioned that the higher the temperature, the quicker the permanent expansion attains completion. In fact, as the results of a large number of high temperature load tests suggest, the maximum permanent expansion will in most cases be completed in a few minutes at 1550° to 1600° C.

TABLE III.

Heat No.	1	2	3	4	5	6	7	8	9
Temperature . . .	908	915	971	987	965	960	960	960	960
Maximum temperature	1005	1000	1020	1020	999	990	990	990	990
Duration of test in hrs.	98	101	114	116	116	116	116	116	116
Total time	98	199	313	429	525	661	777	893	1000
Per cent. expansion on original length . .	0·078	0·103	0·132	0·157	0·201	0·246	0·264	0·260	0·286

THE SPECIFIC GRAVITIES AND AFTER-EXPANSIONS AT 1410° AND 1550° C. OF A SELECTION OF GAS-WORKS SILICA REFRACTORIES.

To investigate the potential value of an "after-expansion" test at 1500° C. on modern silica refractories such as are actually in use at a large number of carbonizing plants in this country, a request was issued to various gas companies, &c., for samples of silica material to be included in this work.

In this way some 60 samples were received at the laboratory, and of these 40 have been selected and tested:

(*a*) For true specific gravity.

(*b*) For "after-expansion" during two hours at 1500° C.

(*c*) For "after-expansion" during two hours at 1410° C.

Unfortunately, at the time this work was proceeding, the "surface combustion" furnace used for the firing of after-contraction test-pieces was functioning inefficiently. The 1500° C. tests were accordingly effected in a large

size circular section Hirsch electric furnace, using test pieces of standard length, but shaped and packed as shown in Fig. 2.

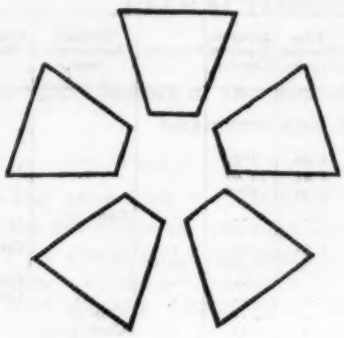


Fig. 2.

Test pieces of similar shape and size were used for the 1410° C. tests which were carried out in the normal way in a gas-fired furnace of the surface combustion type.

The collected data are shown in Table IV.

TABLE IV.

SILICA BRICKS; AFTER-EXPANSION, 1500° C. AND 1410° C.; TRUE SPECIFIC GRAVITIES.

Works No. and Mark.	True Specific Gravity.	Texture.	Per Cent. Expansion at 1500° C.	Per Cent. Expansion at 1410 C.
1 I	2·319	Fine	0·03	0·04
2	2·328	Medium	0·06	−0·12
3 H	2·331	Coarse	0·19	−0·18
4 P	2·331	Medium	0·13	0·11
5 P	2·331	Medium	0·08	−0·11
6 P	2·302	Medium	0·12	0·02
7 A	2·033	Coarse	0·09	0·06
8 I	2·335	Fine	0·12	0·07
9 P	2·335	Medium	0·10	0·10
10 P	2 336	Medium	0·12	0·00
11	2 337	Coarse	0·32	0·03
12 P	2·337	Coarse	0·09	−0·06
13 H	2·342	Fine	0·08	0·04
14 B	2·343	Coarse	0·19	0·12
15 Q	2·347	Coarse	0·16	0·25
16	2·352	Medium	0·06	0·09
17 B	2·359	Medium	0·15	0·17
18 B	2 359	Coarse	0·29	0 03
19 B	2·365	Medium coarse	0·04	0 03
20 I	2·366	Fine	0·31	0·15
21	2·373	Medium	0·62	0·28
22 R	2·390	Medium	0·71	−0 03
23 B	2·391	Medium	0 94	0·15
24 G	2·393	Coarse	1·14*	0·20
25	2·406	Medium	0·22	0·03
26 A	2·419	Coarse	2·50*	0·35
27 H	2·423	Fine	0·89	0·27
28 H	2·425	Fine	1·69	0 46
29 H	2·450	Fine	1 32	0·37
30 Q	2·473	Coarse	1 91	0·54
31 H	2·475	Medium	0·98	0·42
32 H	2·476	Medium	1·05	0·32
33 H	2·496	Coarse	2·30*	0·10
34 S	2·534	Sandy. Light yellow	−0·49	0·51
35 S	2·547	,, ,,	−0·64	0·35
36 S	2·563	Sandy. Brown	−0·25	0 46
37 S	2·563	,, ,,	−1·47	0 31
38 S	2·598	Sandy	0·36	0·36
39 S	2·612	Sandy. Pink	−1·09	0·60
40 S	2·617	Sandy. Pink-white	0·76	0·26
41 A	..	Coarse	1·67	..
42 S	2·619	Sandy	−2·78	0·55

* Warped.

The letters in the first column, headed Works No. and Mark, indicate the maker of the brick and the same letters are used in Tables II. and IV. for the same make of brick. Thus the B bricks in Table II. are made by the manufacturers of 17B or 23B in Table IV.

The results in Table IV. are arranged in ascending order of specific gravities with the exception of bricks Nos. 34S to 40S, which are not true silica bricks, but are rather highly siliceous firebricks analyzing at around 90 per cent. SiO_2; and to facilitate comparison, the expansion data have been plotted against specific gravities in Fig. 3.

On this diagram, the dots refer to " after-expansions " at 1410° C., the crosses to the 1500° C. test results. So far as the true silica bricks are concerned, the broken lines AA^1 enclose the after-expansion results obtained at 1500°, and the continuous lines BB^1 surround the 1410° test-data; the dots around C correspond with the " after-expansion " at 1410° of the highly siliceous bricks Nos. 34S to 40 S. The large " after-contractions " shown by bricks 34, 35, 37, and 39 surround the point D on this diagram.

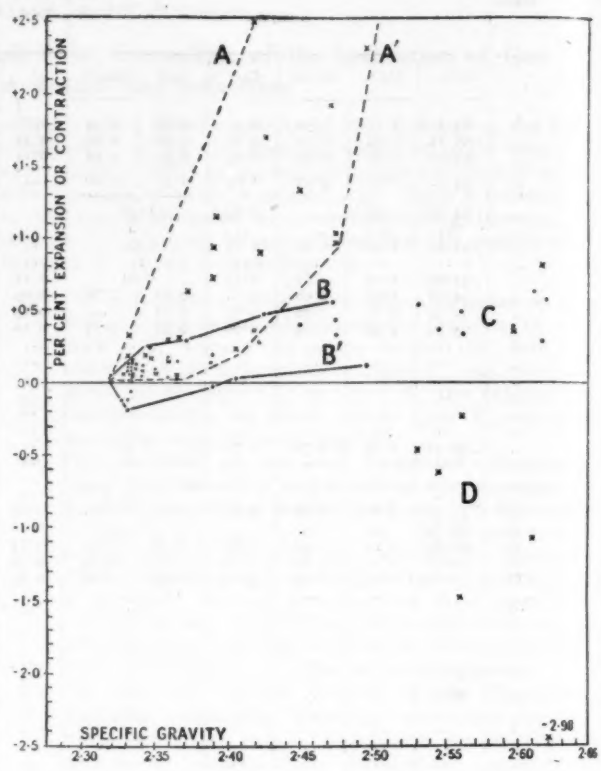


Fig. 3.

Review and Tentative Conclusions.—A critical review of the data formulated in Table IV. and graphed on Fig. 3, appears to justify the following important inferences:

(1) Silica bricks with a specific gravity less than 2·335 will show practically no permanent volume change at temperatures up to 1500° C. The slight " after-contraction " which occurred during the 1400° test on bricks Nos. 2, 3, and 5 is presumably caused by contraction of a well-developed matrix.

(2) Silica bricks with a specific gravity less than 2·36 (+0·005) show a permanent linear change of less than 0·5 per cent. when tested at 1500° C. for two hours. The fact that in some cases the after-expansion of such products is less at 1500° than at 1400° suggests that, in industrial usage at intermediate temperatures, these bricks would be free from permanent volume change of appreciable magnitude.

(3) When the specific gravity of silica bricks is above 2·37 (+0·005) after-expansion at 1410° may or may not be less than 0·5 per cent. (+0·1 per cent.). However, at the higher testing temperature of 1500° C., after-expansion may exceed 0·5 per cent. As the specific gravity increases, permanent linear expansion of greater than 1 per cent. may be recorded; and if the specific gravity exceeds 2·40 (+0·01) " after-expansions " following a two-hours' heating at 1500° may approach the order of 2 per cent.

(4) A testing temperature of 1500° emphatically reveals a tendency towards permanent volume increase of silica refractories of specific gravity of 2·40 or greater, which tendency is not clearly demonstrated by the result of a short period test at 1410° C.

(5) Any specification for the " after-expansion " of silica products should be restricted, as hitherto, to true silica bricks containing more than 92 per cent. SiO_2. Highly siliceous firebricks with a silica content of between 88 and 92 per cent. of SiO_2 form a group totally distinct, physically speaking, from the true silica class of refractories.

(6) Such siliceous firebricks satisfy the demands of the present " after-expansion " specification for silica refractories. However, when the testing temperature is raised to 1500° C., a tendency towards permanent volume con-

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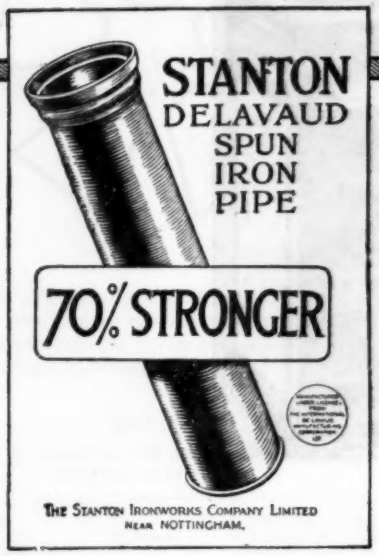
N.B.—The Gas Oven Tests of the Institution of Gas Engineers are satisfied by a "factor of safety" of 60%.



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traction becomes demonstrated. We are accordingly of the opinion that with such materials in industrial service at temperatures in excess of 1400° C. two opposite concurrent effects are probable:

(*a*) A permanent volume increase due to quartz conversion.

(*b*) A permanent volume decrease due to vitrification and shrinkage of the matrix.

With the data at present at our disposal, it is not possible for us to suggest which of these effects will ultimately overcome the other. Further, detailed investigation on this special problem is obviously desirable.

SOLVING THE SMOKE PROBLEM—THE GAS INDUSTRY'S CONTRIBUTION.

By W. M. MASON.

From a Paper before the Annual Congress of the Royal Sanitary Institute, Sheffield, July 13 to 20.

The gas industry in the United Kingdom absorbs practically 18 million tons of coal annually, and converts that enormous quantity of raw material into 318,000 million c.ft. of gas and 12 million tons of solid smokeless fuel in the form of coke and breeze. Over 200 million gallons of tar and 125,000 tons of sulphate of ammonia are also made available for the good of the country, instead of being worse than wasted in the form of smoke. Present atmospheric conditions in our industrial centres are bad enough, but they would be too dreadful to contemplate if the gas industry closed down. If the remarkable service which has quietly but very effectively been built up during a century of usefulness, and without one penny of cost to the taxpayer, were suddenly to emerge as some new wonder, what a sensation it would arouse! A supply of gaseous fuel is now part of the domestic equipment in over 8 million homes—mostly, of course, in the large cities. If we make a modest calculation that in every home at least two chimneys, on an average, have been effectively and permanently cleaned, we begin to realize something of the practical solution being provided by the gas industry.

The gas industry, through its varied services, makes a serious contribution to the well-being, the health, and the happiness of the whole community. It is not a philanthropic institution; it has been built on sound business foundations, but it works on the principle of the square deal, and its activities and developments run parallel to public welfare. From its romantic beginning more than a century ago it has expanded on the soundest lines. In the course of its daily activities the gas industry is conserving our national coal resources in the highest degree. Not only does it produce from every ton of coal carbonized two valuable smokeless fuels—gas and coke—but it also provides a series of bye-products which form bases of many branches of our great chemical industry.

HOSPITAL HEATING BY GAS.

That gaseous heating is healthy is shown by the fact that it is used in the headquarters of such national institutions as the Coal Smoke Abatement Society, the Sunlight League, the Institute of Hygiene, the Royal Institute of Public Health, the New Health Society, the Society of Medical Officers of Health, and the Medical Society of London. In the area of the Gas Light and Coke Company, gas fires are used by 5340 doctors, compared with 2484 in 1912; 512 nursing homes, compared with 114 in 1912; and 204 hospitals, compared with 84 in 1912. St. Thomas's Hospital—one of the largest in London—has more than 250 gas fires and ventilated gas steam radiators in its wards. Westminster Hospital, recently re-equipped, has 186 gas fires in use in wards, medical officers' rooms, and in the bedrooms of its home for the nursing staff. Ninety p.ct. of the dispensaries for tuberculosis, maternity centres, schools for mothers, day nurseries, and crêches use gas fires. At the headquarters of the Royal Institute of British Architects and the Architectural Association are to be found some of the finest gas heating installations in the country.

While civic authorities have power to prevent an individual emptying pollution on the public street or into the river, they are powerless to prevent the same individual from polluting the air. It would seem almost hopeless to expect a radical and permanent improvement until the law steps in and emphatically says, "Thou shalt not," even to the domestic use of fuel; but before such action can hopefully be expected, public opinion must necessarily be educated on the subject. In that good work the Royal Sanitary Institute will continue and develop its national usefulness. Where it can be proved that modern methods of heating could be adopted which would not only solve the smoke problem, but effect economy in time, labour, and cash, one would think that householders would, even on the low ground of personal interest, at once adopt modern scientific methods, such as cooking and heating by gas, electricity, or coke. Where such systems appear to cost more, surely a margin should be allowed for the atmospheric improvements their adoption would undoubtedly accomplish. The healthiness, convenience, and adaptability of gaseous fuel is now far past the stage of serious controversy, exhaustive experiments by independent scientists and public authorities having proved time and again that, from the hygienic, labour saving and utility points of view, nothing is to be gained by the retention of the old barbarous method of consuming raw coal in an open hearth.

THE GAS INDUSTRY AND INDUSTRIAL SMOKE.

In the industrial application of gaseous fuel striking figures are available as to the part the gas industry is playing in reducing industrial smoke. Not only do important trades and businesses, such as catering and food production, increasingly depend on gas as a cleanly, reliable, adaptable, and very efficient fuel, but basic industries, such as engineering, motor construction and repairing, shipbuilding, printing, metal melting, textile processes, catering and food production, bread and biscuit making, fruit preservation, and, literally, over three thousand other trades are now utilizing gas in various processes of manufacture. Nearly 30 p.ct. of the output of gas in Birmingham is supplied for power and industrial purposes, and seven times more gas is used to-day for these purposes than seventeen years ago. In Sheffield the sale of gas for industrial purposes is no less than 46 p.ct. of the total output. In Coventry, 30 large firms take between them 30 p.ct. of the gas output. In London, which is not, of course, mainly an industrial city, there has been a striking growth in the use of gas for industrial purposes in recent years. To-day it amounts to about 3500 million c.ft. per annum, or about 7 p.ct. of the total sale of gas. The increased use of gas arising out of additional installations for industrial purposes in the district of the Gas Light and Coke Company during last year was practically three times greater than the corresponding figure five years ago.

THE MERITS OF GAS COKE.

So much attention has been concentrated upon efforts along other lines that the existence of gas coke has almost been overlooked. Gas coke to-day is a very much improved fuel compared with the average coke available for sale ten or fifteen years ago. A great deal of attention has been paid by the gas industry to the reduction of its moisture and ash contents, to rendering it more readily ignitible, and to grading it in sizes suitable for use in different appliances and for various purposes. These and other improvements have made gas coke a really good solid fuel for burning in open grates. In many types of grate, originally designed and installed to burn coal, coke is being used as an effective substitute. Many efficient appliances designed specially for the burning of coke are also available. Coke is the cheapest fuel for continuous use; it is slightly cheaper than coal. There is, moreover, good prospect of further improvement being made in the coke produced from gas-works by high-temperature carbonization. It is likely that by selecting and blending different kinds of coal, a coke may be economically produced for domestic purposes equal in quality and properties to the best that has been produced by other and more costly processes. There is, therefore, every reason why a more extensive use of graded gas coke in open fireplaces may be expected in the immediate future. As an example of the extent to which it is now being used, it is interesting to note that one London gas undertaking alone has in force separately signed contracts to supply regularly 31,000 private domestic users with coke graded to suit their special requirements.

Protective Coatings for Pipelines.—The American Gas Association, in co-operation with the U.S. Bureau of Standards, is starting an investigation of protective coatings for pipelines. A general study of the nature and method of application of the more common types of coatings is now under way. As soon as this is completed a number of manufacturers will be asked to apply their products to pipe samples, and these samples will be buried in a few localities where the corrosion is known to be severe. Some of the samples will be removed at intervals for examination. Each manufacturer will be expected to meet a general specification as to the nature and thickness of the coating.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Selling Price of Gas.

Sir,—With regard to the article in your issue of July 17, 1929, under the above heading by Dr. G. W. Anderson, I should like to point out that in order to endeavour to equalize our load over the year, a system of differential prices was adopted twelve months ago, when our then ruling prices were reduced by the following discounts or rebates: 5 p.ct. in the months October-March, and 25 p.ct. in the months April-September.

In my particular case the percentage of the total quantity of gas sold annually per month varies from 5·4 to 11·8 p.ct., whereas in the case of the undertaking "A," as shown on the graph, it only varies from 6·5 to 10 p.ct., which only proves that in my case, as against the one cited, it is more necessary to encourage a larger load during the months when the consumption is lowest.

As a result, the percentage increase in the year ended March 31 last amounted to 5·839 p.ct. over the previous year, and during the month of December, 1928, we actually had a slight decrease of 0·8 p.ct.

The present charges for gas per quarter in Macclesfield are as follows:

For the first 36 therms	7½d. per therm
For a consumption of 60 therms the average price is	7d. ,,
,, ,, ,, ,, 130 ,, ,, ,, ,,	6·5d. ,,
,, ,, ,, ,, 200 ,, ,, ,, ,,	6·25d. ,,
,, ,, ,, ,, 350 ,, and over ,,	6d. ,,

The above scale of charges is subject to a discount of 7½ p.ct. in the two quarters December and March, and a discount of 33⅓ p.ct. in the two quarters June and September, when payment is made within 21 days of demand.

The above discounts are applicable to the power scale of charges, which varies from 6½d. to 4d. per therm gross.

H. Curtis,
Engineer and Manager.

Corporation Gas-Works,
Macclesfield,
July 18, 1929.

REGISTER OF PATENTS.

Crank and Index Spindle Mechanism.—No. 313,545.

Bingham, J. H., of Dorney Common, and George Glover & Co., Ltd., of Chelsea.

No. 7733; March 13, 1928.

This invention relates to improvements in the crank and index spindle mechanism of gas meters, and provides an improved fitting for supporting the crank spindle and the index spindle in a unitary structure, so that these parts can be inserted in, or removed from, a gas meter as a single unit.

A base plate, an index spindle bearing plate, and a supporting plate are formed from a single piece of sheet metal by bending. The supporting plate may be provided with an extension so arranged relatively to the bearing plate and supporting plate that these parts can readily be put in position within the meter supported on an angle or corner of a compartment in which the index mechanism is lodged, together with the quantity spindle in the case of a meter provided with coin-freed mechanism controlling the supply through the meter.

The fitting comprises parts having bearings formed therein to support the crank spindle having mounted thereon the usual connecting rods for moving the valves, the tangent connected by links to the arms oscillated by the bellows, as well as a worm for rotating the index spindle. A bracket may also be provided opposite to the index spindle bearing plate to support one end of this spindle. The fitting can be made from a single piece of sheet metal by bending.

This construction is chiefly applicable to meters of the so-called open top type in which the gas is admitted to the meter above the valve plate, and can be conveniently employed in meters of this type in which the gas supply valve is opened or closed by the operation of coin-freed mechanism.

Repairing Cracks in Retorts.—No. 313,728.

Woodall-Duckham (1920), Ltd., and Duckham, Sir A. M., both of Victoria Street, S.W. 1.

No. 15,307; May 24, 1928.

The difficulty of repairing heated structures such as furnaces and retorts by filling with jointing mixture cracks that may have developed in the structural material is associated with the difficulty of locating the crack and causing penetration of the jointing mixture into the crack. The position of the crack is generally indicated by a leak of combustible gas which becomes visible by an appearance of flame or by abnormal incandescence of surrounding brickwork due to surface combustion.

One known method of dealing with the crack consists in forcing jointing mixture by air pressure from a container through a pipe directed on to the crack. The proportion of water that must be present in a mixture which will flow through a pipe is considerable; and before sufficient solid jointing material has been injected into the crack, cooling has occurred and the crack has become invisible, making continued injection difficult; such sudden cooling has, moreover, a deleterious effect upon the brickwork, and, further, the effect of applying such a dilute mixture is that the mixture is unnecessarily spread over the surface and the crack is bridged rather than entered, so that, though it is temporarily stopped and disappears, it is soon again leaking.

The invention is based on the conclusion that the jointing mixture should be less fluid than has hitherto been usual, and should be injected into the crack by a single application which should suffice to seal the crack by proper penetration of the mixture into it. To render this possible, a sufficient quantity of the jointing mixture must be injected into the crack with accuracy, quickly, and with great force.

The invention relates to a method of repairing heated structures of the kind in question by bringing a charge of jointing mixture substantially into register with the crack, and then projecting the charge into the crack by means of a suddenly developed or released force. The charge should not exceed the quantity estimated as likely to be required to fill the crack, because, in addition to being wasted, the excess would adhere to the surface of the structure, forming protuberances to which there are well-known objections.

The invention necessitates an apparatus which can be raised or lowered or thrust horizontally or otherwise into the furnace or retort by means of a carrying and guiding rod, until opposite the crack to be filled, as contrasted with bringing the jointing mixture to the crack by means of a pipe leading from an apparatus outside the furnace.

The jointing material is preferably enclosed in a container having a discharge orifice which in operation is brought into alignment with the crack to be sealed; a pressure is suddenly created or released behind the mixture, so that this is suddenly projected into the crack with great force. The pressure may be created by any suitable means, such as by an explosive or by the sudden release of suitable liquid or gaseous pressure. The discharge orifice may conveniently be a slot considerably longer than it is wide, formed by tapering sides, so that, by turning the container one way or the other, either horizontal or vertical cracks may be filled by bringing the major axis of the slot parallel to the direction of the crack.

Oil Films in Gasholder Tanks.—No. 313,776.

Matthews, F. G., and Matthews, R. C., both of Chertsey.

No. 19,750; July 7, 1928.

This invention comprises a syphon for use in connection with the oiling of gasholders in lieu of painting them. The inventors have found from practice that a layer of oil on the water in the tanks and cups of holders arrests and prevents corrosion of the cup-plates and side-sheets; only the crown and two top sheets, which do not dip into the oil, requiring painting.

The oil being always on the surface of the water would rise during a storm and wash over into the cup below. With this syphon the oil is always on the surface and the water at the required level, and it will automatically syphon over surplus water and discharge it into the cup or tank below through the pipe at the bottom of the syphon. There are two bends fixed at the top of the syphon which run over into the cup; one being only a support and blanked off. The bottom of the outlet port leading into the funnel is the level at which it is desired to keep the water; and through this port the surplus water overflows to be carried away to the cup below. The syphon is fitted with a filling plug and a draining plug for emptying during frost.

Gas Ovens.—No. 313,902.

Forshaw, A., of Falkirk, R. & A. Main, Ltd., of Grosvenor Gardens, S.W. 1, and Wortley, G. W., of Falkirk.

No. 8341; March 19, 1928.

This invention is to provide a construction which will permit the rapid heating of the oven without the risk of the burners being smothered by the products of combustion. There is provided a baffle plate constructed for location above the burners of the ovens, which baffle plate comprises an opening directed upwardly and a deflecting surface which extends from the aperture downwardly towards the centre of the oven. The invention is particularly applicable to gas ovens of the type in which the burnt gases are withdrawn from the oven through an outlet at the bottom. The burners and baffles are disposed at the side of the oven, and the ripples of the burners project the flames in an upward direction through these apertures. The invention also includes a base-plate for a gas oven comprising a

frame which is provided with means (*e.g.*, channels) for supporting the side and back walls of the oven, an apertured baffle plate along each side member of the frame, which baffle plates extend laterally towards the centre of the frame, and means for supporting a burner beneath the apertures in each baffle plate. Preferably, each baffle plate is arranged to extend to one side of its respective burner in a downward direction towards the centre line of the oven.

A further feature of the invention consists in arranging the frame so as wholly to support the weight of the sides and back of the oven, and in providing means beneath the frame (*e.g.*, a downwardly directed flange formed integrally with the frame) for supporting the gas oven on a stand. Alternatively, where the base-plate is embodied in a double-walled gas oven, the outer walls of the oven are secured against the outer edges of the frame, and are extended downwardly beneath the frame so as to support the oven on a stand.

A further feature of the invention consists in providing the rear member of the frame with an aperture which forms an outlet port for communication with the flue. The rear member of the frame may be provided with an arch, the rear edge of which is recessed for the purpose of providing the port. By this means the location of the outlet to the flue may be disposed at the required distance above the burners.

Horizontal Joints of Vertical Retorts.—No. 314,231.

WEST, E., and WEST'S GAS IMPROVEMENT COMPANY, both of Manchester.

No. 19,954; July 9, 1928.

This invention relates to vertical retorts, and comprises the improved construction of retorts in which no horizontal joints in the retort walls are exposed in the combustion chambers around the retorts. The retort walls are built up of superposed sections, each section comprising a ledge course which projects beyond the retort and serves to support the floor tiles at the base of each combustion chamber around the retort, a key course, and chamber tiles extending from the key course, which is at the level of the floor tiles, and the ledge course beneath the floor tiles of the combustion chamber above.

The ledge course is made up of sections with grooves at one side and tongues at the other side. Thus the upper side may be grooved to receive a tongue on the lower side of the key course, and the lower side have a tongue to enter a groove in the tops of the chamber tiles beneath. The part of the ledge course which projects beyond the retort and serves to support the floor tiles at the base of the combustion chamber around the retort is extended downwards to overlap the tops of the chamber tiles below, so as to cover the horizontal joint between the ledge course and the chamber tiles and leave only a vertical joint in the combustion chamber beneath. The key course has a groove at one side and a tongue at the other. The tongue may, as before stated, extend into the groove in the ledge course below, and the groove in the upper side may receive a tongue around the bottom of the chamber tiles above. The horizontal joint between the chamber tiles and the key course is covered by the floor tiles, which extend above the joint and leave only a vertical joint into the combustion chamber above; the floor tiles are also shaped to overlap the outer edge of the ledge tiles so as to cover the horizontal joint between the key course and the ledge course and leave only a vertical joint to the combustion or other chamber below the floor tiles.

With the aforesaid construction, state the patentees, all the horizontal joints are covered or protected from the combustion or heating chamber side, so that the opening of horizontal joints by any bulging or distortion of the retort due to heat and the pressure of the charge within the retort is obviated.

Coke Oven Doors.—No. 314,281.

WOLFF, E., of Linden-Ruhr.

No. 26,898; Sept. 19, 1928.

According to this invention a self-tightening oven door is provided, which has around it a rigid door frame constructed so strongly that distortion due to thermal expansion cannot give rise to small local deflections, but only to bends of comparatively large radius gradually merging into each other if two or more of them occur in one structure. Thus the contact surfaces may be bent entirely into convex or concave form, or they may be in the form of a warped or sinuous curve. Deflections from the normal plane are small, and merge gradually into each other, no matter from what cause the bending stress arises. A counter packing is provided on the door consisting of a packing frame of profiled iron, adapted to be pressed against the door frame at various points, and sufficiently rigid to preserve proper tightness at these points; but as regards its whole length it is sufficiently flexible to accommodate itself to the gradual bends imparted to it by the relatively rigid door frame. In order to enable the frame to recover its normal shape in relation to the door, and to insulate the frame from the effects of distortion of the door itself, the frame and door are connected by a thin metal plate. This metal plate acts both as a support for the frame and as a packing member between the frame and the door, and it provides a flexible or resilient connection, for permitting relative movement between the frame and door when screwing the outer frame down on the door frame. In connection with doors having a packing of asbestos cord, thin plates of this kind have been used for supporting and pressing down the asbestos cord.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for July 10.]

Nos. 20,075—20,861.

ALADDIN INDUSTRIES, LTD.—"Incandescent mantle mountings." No. 20,754.
BRASSERT & CO., LTD., H. A.—"Gas washing apparatus." No. 20,861.
DEMPSTER, LTD., R. & J.—"Lifts for waterless gasholders." No. 20,770.
DOUCHEMENT, A. J.—"Gas pipes." No. 20,643.
DUFFIELD, F. L.—"Low-temperature carbonization of fuel." No. 20,765.
GILBERT, A. T.—"Coin-freed gas meters." No. 20,859.
HIDAKA, H.—"Bituminous water gas generators." No. 20,556.
KNIGHT, N. H.—See Dempster, Ltd., R. & J. No. 20,770.
KROMSCHRODER AKT.-GES., G.—"Valve gear for gas meters." No. 20,477.
MACKENZIE, M.—"Production of coke." No. 20,741.
PERKINS, H. A.—"Gas or fluid cock." No. 20,355.
ROBINSON, J. C.—"Gas heated incinerators." No. 20,438.
SHIPLEY, A. H.—"Means for stopping gas mains." No. 20,525.
SLATER & CO. (ENGINEERS), LTD., J.—See Robinson, J. C. No. 20,438.
ULBRICHT, R.—"Gas burners for cooking stoves." No. 20,150.
WESTON, SHIPLEY, & WESTON, LTD.—See Shipley, A. H. No. 20,525.

[Extracted from the "Official Journal" for July 17.]

Nos. 20,862—21,660.

ALDER & MACKAY, LTD.—"Dry gas meters." No. 21,394.
ANDERSON, J.—See Alder & Mackay, Ltd. No. 21,394.
CHUBB, W. F.—"Controls for gas-fired furnaces." No. 21,292.
FAGELSTON, I.—"Gas analysis." No. 21,430.
GIBBONS BROS., LTD.—"Regenerative gas furnaces." No. 21,543.
HARVEY, A.—See Gibbons Bros., Ltd. No. 21,543.
JACKSON, H. W.—See Gibbons Bros., Ltd. No. 21,543.
JADOUL, A.—"Gas producers." No. 21,386.
KOPPERS COMPANY.—"Coking retort ovens." No. 21,122.
MITCHELL, G. P.—"Gas cookers." No. 20,864.
PAIN, W. F. & W. H.—"Gas brackets." No. 21,471.
SADLER, H. S.—"Gas washers." No. 21,516.
SOUTH METROPOLITAN GAS COMPANY.—Manufacture of fuel briquettes." No. 21,090.
STANIER, H.—See South Metropolitan Gas Company. No. 21,090.
SUTHERLAND, J. G.—"Dry gas meters." No. 21,186.
WOODALL-DUCKHAM (1920), LTD.—"Tunnel kilns." No. 20,942.

PARLIAMENTARY INTELLIGENCE.

[From Our Special Correspondents.]

HOUSE OF LORDS.

The Special Orders Committee have reported that no petition has been presented praying to be heard against the under-mentioned Special Orders, and that there is nothing in them to which they think it necessary to call the attention of the House: Andover Gas Order; Weymouth Gas Order; Wateringbury Gas Order; Boston Gas Order. In the case of the Cleveland and Dudley Gas Orders, the Committee have considered certain modifications proposed by the Board of Trade, and recommend their adoption. In the case of the Stockport Gas Order the Committee recommend the adoption of certain modifications proposed by the Board of Trade, and also state that they have considered the points raised in petitions against the Order by the Urban District Councils of Handforth, Bredbury and Romiley, Cheadle and Gatley, and Hazel Grove and Bramhall, but that they are of opinion that there ought not to be a further inquiry by a Select Committee. All these Orders are now awaiting the Affirmative Resolution.

The Inverness Water and Gas Order Confirmation Bill has passed its Third Reading and been sent to the House of Commons.

The Bury St. Edmunds Gas Order has been referred to the Special Orders Committee.

HOUSE OF COMMONS.

Romford Gas Bill.

The Romford Gas Bill was read a second time and committed on July 16. On a motion to suspend the Standing Order with a view to accelerating the Committee proceedings, Major COLFOX raised objection to the proposal, and urged that the Bill should be carried over until the autumn. After a brief discussion the motion was, however, agreed to, and the Bill was reported from the Committee with amendments on Thursday.

Government Unemployment Schemes.

Speaking on the Money Resolution for the Development (Loan Guarantee and Grants) Bill on July 16, Mr. J. H. THOMAS said that

the most important section of the Resolution was that dealing with assistance to public utility undertakings operating under statutory powers. He enumerated these, concluding with a reference to gas undertakings, but gave no further details of his proposals in regard to gas. It is understood that a deputation from the National Gas Council has since interviewed Mr. Thomas on the subject, and that discussions are continuing.

The Inverness Water and Gas Order Confirmation Bill passed its Third Reading on Monday.

The Lords Amendments to the Romford Gas Bill were considered and agreed to on Monday, and the Bill passed its Third Reading.

ROMFORD GAS BILL.

One of the few Private Bills left over from the last Parliament was that of the Romford Gas Company, which passed the House of Lords before the General Election. The Bill came before the Unopposed Committee of the House of Commons on Thursday, July 18, Mr. ROBERT YOUNG (Chairman of Ways and Means) presiding.

Mr. BROWNE (Messrs. Dyson, Bell, & Co., Parliamentary Agents), presenting the Bill, said it was promoted by the Romford Gas Company, which was established as a non-statutory concern in 1847 and was registered under the Companies Acts in 1874. The Company, he stated, had been well managed and was prosperous, and the Directors felt it was now time that the Company should have the advantage of the status of a statutory undertaking and come under more direct control of Parliament. The object of the Bill, therefore, was to dissolve the present limited Company and to re-incorporate it as a statutory Company, having such powers as the old Company possessed and such additional powers as it is customary to give to gas companies having statutory authority. At the same time, the opportunity was taken to consolidate and convert the existing capital in order to have one class of ordinary stock only, and to adopt the modern basic price principle for regulating the distribution of dividends. There was a well settled set of clauses which dealt with that matter, and they were embodied in the present Bill. The provisions of the Bill were quite normal, but there was a point in connection with the special purposes fund to which he would draw the special attention of the Committee. By the Gas Undertakings Act of 1929, passed earlier this year, it was provided that wherever a gas company was authorized to establish a special purposes fund, the maximum of that fund should not be determined in relation to the paid-up capital only—as had been the practice hitherto—but should be determined in relation to the paid-up capital *plus* the outstanding loans. The outstanding loans, naturally, were a fluctuating amount, and the point had been dealt with in the present Bill by an addition to the general clauses relating to the special purposes fund to the effect that the maximum of the special purposes fund should be one-tenth of the paid-up capital and of the outstanding loans. It was further provided in the Bill that if at any time the special purposes fund should have reached the maximum in relation to the paid-up capital and the total loans authorized and raised, then the promoters should not be compelled to make a proportionate reduction in the special purposes fund should the amount of outstanding loans be decreased. This also was provided for in the Gas Undertakings Act of 1929.

Mr. W. MACKINDER (Lab.—Shipley) asked whether it was usual for gas companies to take powers to charge for cutting off supplies.

Mr. BROWNE said it was the usual clause in gas bills—though there were not so many of them nowadays—but it was also a common form clause in Board of Trade Orders under the Gas Regulation Act.

The CHAIRMAN: So far as I know it is quite general.

Mr. BROWNE said the position was that when a consumer was in default for payment of gas bills the clause enabled the gas company to recover the amount owing and also to refuse to re-connect the supply, after payment of the arrears, unless the cost of the re-connection was paid.

Mr. MACKINDER said he could understand the cost of re-connection being charged, but he did not think a charge should be made for cutting off the supply.

Mr. BROWNE: It all arises out of the consumer being in default.

Mr. MACKINDER: If a man has not the money to pay for gas he has consumed, he certainly has not money to pay for cutting off the supply.

Mr. BROWNE said that, as a matter of fact, gas companies were very lenient with defaulters, but the point was that if the consumer whose supply was cut off did not bear the cost, then it fell upon the other consumers.

The CHAIRMAN: I believe there are plenty of precedents for this?

Mr. BROWNE: Yes.

Mr. G. BERRIDGE (Secretary and Commercial Manager of the Romford Gas Company) then formally proved the preamble of the Bill, and it was ordered to be reported for third reading.

MISCELLANEOUS NEWS.

INSTITUTION OF CHEMICAL ENGINEERS.

Examination Questions for Associate-Membership.

We have received from Prof. J. W. Hinckley, the Hon. Secretary of the Institution of Chemical Engineers, a copy of the papers for the Associate-Membership examination of the Institution this year. As on previous occasions, the candidates were entertained at dinner at the Chemical Industry Club, after which a *viva voce* examination was held.

To give our readers some idea of the questions set in the written examinations, the following have been selected:

1.—Describe any apparatus you would use to determine the calorific value of a fuel.

One gramme of oil as burned in a bomb calorimeter containing 2200 grammes of water, the water equivalent of the instrument being 481 grammes.

The following observations of the temperature were recorded:

Preliminary Period.

Time in Mins.	0	1	2	3	4	5
Temp. °C.	10·23	10·23	10·24	10·24	10·25	10·25

Burning Period.

Time in Mins.	5½	6	7	8
Temp. °C.	10·80	12·90	13·79	13·84

Subsequent Period.

Time in Mins.	9	10	11	12	13
Temp. °C.	13·82	13·81	13·80	13·79	13·78

Calculate the calorific value of the oil.

2.—What do you understand by the coefficient of heat transfer and determine this in the following case:

A pipe 1¼ in. diameter by 20 ft. long is surrounded by a second pipe 2 in. in diameter. 850 galls. of water per hour enter the inner tube at a temperature of 220° Fahr. and leave at a temperature of 120° Fahr., while another liquid flows in the opposite direction through the annulus, entering at 60° Fahr. and leaving at 190° Fahr.

3.—Give the cycle of operations in any type of refrigerator with which you are acquainted. State the various materials used as refrigerants and indicate briefly the importance of refrigeration to the chemical engineer. State how refrigerating machines are usually rated, and discuss critically the value of such ratings.

4.—Describe, with sketches, one only of the following:

(*a*) A gas-fired reverberatory furnace for calcining material at 1000° C.

(*b*) A furnace suitable for burning sulphur.

(*c*) A muffle furnace.

5.—Describe, with good sketches, the type of plant you would propose to instal for the movement of any two of the following materials:

(*a*) Hot coke from a gas retort.

(*b*) Very short pieces of cotton which have just left a drying machine and have to be moved to a higher level for packing.

(*c*) Powdered cement from the ball mills to the silos in a cement factory.

(*d*) Salt coming from a large vacuum evaporating plant.

6.—Sketch a brickwork setting suitable for a tar still.

What would be the effect of reducing the cross-sectional area of the flues while maintaining the same heating surface on the still?

7.—Write a short essay on the classification of refractories and their selection for use in furnace building for chemical manufactures.

PROVISION FOR GAS MAINS.

Grass Verges on Roads.

The following letter from Mr. R. W. Edwards, Chairman and Managing Director of the Aldershot Gas, Water, and District Lighting Company, appeared in "The Times" for July 16:

I should like to endorse certain remarks of Prof. Abercrombie in his letter appearing in "The Times" of the 9th inst., and particularly that referring to grass verges as "an economy rather than an extravagance."

For many years past now I have viewed with ever-increasing apprehension the spread of the use of ferro-concrete in the construction and reconstruction of highways, on account of the vastly greater difficulty in detecting leakages, and cost and inconvenience in remedying them when once detected. Where ferro-concrete is used, countless safety-valves, as it were, permitting the diffusion of gas in imperceptible quantities, are closed up, and it is rendered not only possible, but even probable, that the first indication the gas undertaker may have of an escape of gas may take the shape of a miniature earthquake.

What, then, is the remedy? It is more and more essential in view of the requirements of modern traffic that durable road surfaces should be constructed, and that once constructed they should remain, as far as possible, undisturbed. At the same time, provision must be made for public services. Obviously, to my mind, the remedy lies in the provision of wide grass verges whenever roads are constructed, and, if possible, when existing roads are reconstructed. This may at first sight seem rather ideal than practical, but "necessity is the mother of invention," and far more idealistic conceptions than the provision of grass verges on all country roads—as distinguished from existing streets in centres of population, where subways would be the alternative—have become every-day realities within the recollection of those now living. I, therefore, desire most heartily to associate myself with the words of Prof. Abercrombie when he says of grass verges that "they are an economy rather than an extravagance," for this is just the principle which in speeches and in articles I have been striving to inculcate for years.

SOUTH SUBURBAN CO-PARTNERSHIP FESTIVAL.

Dr. Charles Carpenter's Address.

On Saturday afternoon last, July 20, the co-partners of the South Suburban Gas Company held their annual festival at the Crystal Palace. The afternoon was devoted to an excellent variety entertainment in the Crystal Palace Theatre by Fred E. Wildon's London Entertainers, after which tea was served in the various restaurants. About 2000 were present.

During the interval in the programme, Dr. CHARLES CARPENTER, C.B.E., addressed the co-partners.

THE ADDRESS.

Dr. CARPENTER said it gave him great pleasure to welcome them there on that occasion, which marked the thirty-fifth year of their co-partnership scheme. Having regard to the number of years during which the system had been in being, it would be unnecessary for him to say very much that afternoon of its aims, particularly as he felt that it was interrupting their amusement.

As they knew, his predecessor came to the conclusion many years ago that the method and mode of controlling industrial organizations was out of date and not in accordance with modern conditions of industry; and so he promoted what he considered more essential than anything else towards a happier relationship between what they usually described as capital and labour. How far he had succeeded in his purpose they were in as good a position to judge as he was. They had been for a long period enjoying the advantages which his foresight and goodwill had provided for them.

He wanted to remind them of one or two things which co-partnership did for them as it did for the Company. It provided a rate of salaries and wages in common with similar industries. Parliament ordained that they should be entitled to the use of their capital, and Parliament wanted to go further still in this. He went on to describe the co-partnership scheme as it affected the South Suburban Company. First of all, the obligation on the part of capital to labour was equality of distribution in the results of what was obtained. The co-partnership which they had practised for so many years meant the employers' recognition of the fact that all labour desired was greater interest in their work than the mere getting there in the morning and going again in the afternoon. Labour asked that it should be admitted into the councils of the industrial undertakings, and it asked that it should know what was going on behind the doors of the Board Room—that workmen should sit with the Directors and take part in the discussions, so that all could be fully advised exactly what the undertaking was doing. There was no excuse for any co-partner in the Company being in the dark as to what the Company was doing.

The Company's progress did not get any easier as time went on. Competition was becoming more intense and aggressive, and now was the moment when co-partnership could be appreciated by all. From time to time in this concern there would be various works discussions—sometimes technical—and it was these which led to greater interest in the work and a gradual increase in the general happiness and contentment on the part of the workers. Absence of grievances of any kind was the characteristic of the life of the average worker.

They had every reason for rejoicing that these ideas of the late Sir George Livesey which came into operation so many years ago had borne fruit. Many employees now in their own houses were living in contentment for the remainder of their days.

Arrangements for superannuation, continued Dr. Carpenter, were liberal in the extreme, and had been stabilized to the modern conditions of industry. Co-partnership could never be complete unless the employees fully appreciated the fact that it was their duty to do their best for their undertaking. He had never had any reason to doubt that their employees were conscious of their obligation to their Company. In these days of keen competition the only way in which they could carry on their industry was by stringent economy and no waste of materials; it being in the interest of the employees to give of their best in their work. Results which had stood up in the past would continue to stand as time went on. The ideas set out by Livesey were just as true to-day as they were then; humanity was just the same now as it was then. Of all the proposals that had been put forward to surmount the difficulties of industry, and of all the methods that had been tried, none had succeeded so magnificently as co-partnership.

It was a glorious heritage which they were enjoying to-day, concluded Dr. Carpenter, and he earnestly asked them to maintain in the future those traditions which they had so gloriously carried on in the past.

LARGE GERMAN GAS UNDERTAKINGS.

The question of long-distance gas supply and municipal industry was raised in a paper read on June 30 at the Fourteenth Annual Meeting, in Hamburg, of the Association for Municipal Industry and Policy (Verein fur Kommunal Wirtschaft and Kommunalpolitik), by Herr D. Seippel, of Essen, one of the Directors of the Ruhr Gas Company (Ruhrgas, A.G.). The object of the paper was evidently to exercise a quietening influence on municipal bodies which own gas-works, the author stating that it was completely free for the local authorities in considering their interests to enter into contracts for the delivery of gas transmitted over a distance, or to continue their own production. The carrying-out of the system of distant supply by no means presumed the stoppage of all municipal works. Only a certain displacement in the municipal production would take place, and this would experience an increase rather than a reduction. In this way the scruples entertained against a possible coke monopoly would drop. In conclusion, the author expressed the hope that, by means of confident co-operation between municipal bodies and representatives of the distant supply gas interests, a solution would be found which would be of advantage not only to the Ruhr coal mining industry and the municipalities, but also to general economy.

The Berlin Company, which is only an operating concern for the works directly belonging to the City of Berlin, reports an increase in the production from 474·49 million cub.m. in 1927 to 489·62 millions last year. Thus in a year of a declining trade situation it has been possible to record an increase of 3·2 p.ct., as compared with an advance of 3·45 per cent. in the previous year. In this connection it is noted that the loss through the change-over from gas to electricity in the lighting of dwellings is estimated at about 18 million cub.m., or (say) 3·8 p.ct.

The augmentation in the sales last year is ascribed to intensive recruiting work, and to no less than 10·8 million cub.m. applied to the larger use of gas for industrial purposes, and 4·6 millions to domestic uses. The market for bye-products was satisfactory, and coke and tar found a ready sale, though the latter at falling prices.

If the working results last year were relatively favourable, the report states that the explanation lies in the fact that the prices of English coal were favourable. Though in the inland market a price increase took place for coal, and the cost of transport was higher, it was possible to get the average price of the coal purchased down by 85 pfennigs (10d.) per ton. With a total consumption of 1,070,000 tons of coal, the deliveries of English coal increased by about 10 p.ct. (0·36 million tons, as compared with 0·27 million in 1927), whereas the use of Westphalian coal diminished from 0·34 million tons in 1927 to 0·30 million last year, and that of Lower Silesian coal from 0·16 million to 0·12 million tons. On the other hand, the balance of the consumption was obtained from Upper Silesia.

According to the financial results, the share of the City of Berlin in the working profits has increased from 6·85 million marks in 1927 to 7·14 millions last year, and the sum set aside for works maintenance is 12·77 million marks, as compared with 12·76 millions in 1927. The final result is a net profit of 8·18 million marks (7·91 millions in 1927), of which the city receives 7·10 millions, as against 6·90 millions in 1927, and the balance is applied to interest payments on capital.

THE CONTINENTAL COMPANY OF DESSAU.

The Deutsche Continentale Gas Gesellschaft of Dessau, which maintains a leading position among the private gas and electricity undertakings in Germany, experienced further development in 1928, as the turnover in gas and electricity increased and the working results improved. It was also possible to extend the basis of business activity by the conclusion of long-term concession contracts, and through the addition of new areas of supply.

For the first time the profits yielded by the Company's own works and its participations, including interest receipts, exceeded the sum of 10 million marks. Including the balance forward, the gross surplus rose from 9·43 million marks in 1927 to 10·59 millions last year. The net profits are 7,379,000 marks, as compared with 6,487,000 marks in 1927; and the rate of dividend is 9 p.ct., as against 8 p.ct. in 1927.

The aggregate sales of gas increased from 285 million cub.m. in round figures in 1927 to 306 millions last year, and those of electricity from 516 million kilowatt-hours to 554 million kilowatt-hours in the two years respectively. At some of the existing gas-works new districts were connected up, and these again were joined up with the western network in the Ruhr. The results of the gas-works were unfavourably influenced by the price advance in German coal and the increase in railway rates, but the market for bye-products afforded no compensation. It was only possible by means of greater measures of rationalization to equalize the growth in the working expenses. The efforts put forward to form regional combinations for gas supply were continued, as for instance by the constitution of the Saale Distant Gas Supply Company of Halle.

ACQUISITION OF A COLLIERY.

Speaking at the general meeting of the Dessau Company on June 25, Herr Hech is reported to have stated that, whereas the chief object of the Company a few years ago was the extension of electrical current, as this supply in Germany has now reached a certain conclusion, at present the supply of gas has come in the forefront.

Concerning the acquisition of the Westfalen Colliery, the speaker stated that without the reserve of a pit it would not have been possible to have made firm long-term offers to supply the City of Magdeburg and the Central German regional; at least it would have been venturesome. The conditions with the Company to-day were such that it would be possible to consume the whole of the coal production of the Westfalen Colliery in the Company's own works, if the regulations of the Westphalian Coal Syndicate did not hinder the use of the entire output. As a consequence the Syndicate hampered the Company; and when the Syndicate came to be renewed, attempts must be made to get relief from the obstacles, and the whole of the German gas industry would throw its weight in the scale.

SATISFACTORY YEAR'S WORK AT ALLOA.

Extension of Discount Rates.

At a meeting of the Alloa Gas Committee, held on July 15, Bailie Younger, the Convener, presented the accounts of the Gas Department for the year to May 15, 1929. On the income side, the sale of gas yielded £32,338, being a less amount by £7500 on the income of the previous year, due to the substantial reduction made in the price of gas. Residual products yielded £6783, being almost £3000 less than was estimated, the reduced incomes chiefly arising from a slump in the price of tar, and tar products. On the expenditure side, coal cost £12,229, being about £600 below the estimate; repairs of works, £3492; rates and taxes, £2420. The total expenditure amounted to £28,365, and the total income to £39,657, leaving a gross profit of £11,292. Payment to sinking fund was £4660; interest on loans, £3201; income-tax, £1065; and bad debts, £26. The net result of the year's working showed a profit of £2281.

The Committee approved of the statement and considered the financial result to be highly satisfactory. In accordance with the arrangement come to, that the Gas Department should liquidate a sum of £11,000 over a period of ten years, being one-third of the remaining debt of the Electricity Department, a sum of £1100, with £550 of interest, £1650 in all, will be paid from the gas profits.

ESTIMATES.

The Convener stated that an estimate of income and expenditure for the current year showed a gross profit of £13,180. Coal would cost about £700 less, while local taxes and income-tax would be increased £800 and £2200 respectively. An increased revenue from the sale of gas was expected, while residuals, it was hoped, would show an increase. The estimated net profit was £1964, and this amount would be available to meet the annual payment for electricity losses. The Committee considered the rates for gas for the current year. On the recommendation of the Convener, it was agreed that the present price for gas for ordinary and automatic consumers—viz., 3s. 5½d. and 3s. 8d. respectively—should remain the same as last year. As regards the rates for industrial gas, these were at present on a scale of consumption from 2s. 9d. to 2s. per 1000 c.ft. In view of the very large demand from public works, it was agreed, after discussion, to extend the scale, and institute a rate of 1s. 9d. for an annual consumption of 7½ million c.ft., and 1s. 6d. for 10 million c.ft.

The rates now fixed are to be in force for a period of six months, as from the April inspection of meters, the prices to be again reviewed at the end of that period.

TRADE NOTES.

Scientific Instrument Developments.

From the Sales and Research Department of Adam Hilger, Ltd., of 24, Rochester Place, Camden Road, N.W. 1, we have received a bulletin of developments in scientific instrument design and use, covering thirty months ended Dec. 31 last.

"W-D" Tunnel Kilns.

The Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., have received orders for three Woodall-Duckham circular tunnel kilns, one for Shanks & Co., Ltd., at Barrhead, one for Doulton & Co., Ltd., at the Royal Doulton Potteries, Burslem, and the third, a repeat order, for Southhook Potteries, Ltd., at Kilmarnock.

Contract for Waterless Holder.

The Ruhrgas A.G., who are the distributing Company for the Ruhr gas grid, have standardized the "M.A.N." type waterless gasholder for their storage equipment. A contract for a 4½ million c.ft. "waterless" has recently been placed, and is the third waterless ("M.A.N.") holder of the same capacity ordered by this concern during the past year.

Gas Chambers and Coke Ovens, Ltd.

We are informed by Messrs. Gas Chambers and Coke Ovens, Ltd., that developments in their business as Engineers and Contractors for intermittent vertical chamber ovens (C.O.L. system) and Collin coke ovens have necessitated the Company's transference to larger and more convenient offices at Artillery House, Artillery Row, London, S.W. 1.

"T.I.C." Plants for Fleetwood and Palmerston (N.Z.).

The Woodall-Duckham Vertical Retort & Oven Construction Company (1920), Ltd., have received an order from the Fleetwood Gas Company for a "T.I.C." tar treatment plant, having a nominal capacity of 10 tons of crude tar per 24 hours. In addition, an order has been received from Messrs. William Coward & Co., Ltd., for a "T.I.C." tar plant capable of dealing with 8 tons of crude tar per 24 hours. This plant is for shipment to Palmerston North, New Zealand.

A New Gas Appliances Catalogue.

Messrs. Falk, Stadelmann & Co., Ltd., of 83-93, Farringdon Road, E.C. 1, have published their latest list and catalogue of gas appliances. The "Bakerloo," "Reliable," and "Household" model gas cookers are dealt with, together with many other types of hotplates, grillers, and rings. The new patent "Rapid" cooker lighter (as described and illustrated in the last issue of the "GAS SALESMAN") is also explained in detail. Among the other appliances incorporated in the list are gas irons of various types, wash-boilers, fires, geysers, gas pokers, and soldering iron heaters, regarding each of which full particulars as to price and finish are included.

BOROUGH OF HEYWOOD GAS DEPARTMENT.

Satisfactory Year's Work.

The gross revenue amounts to £35,080, and the gross expenditure (*less* interest and sinking fund) to £26,433, leaving a gross profit of £8646. A sum of £1860 has been paid direct out of revenue for renewal of plant.

The total quantity of gas manufactured amounts to 154,664,000 c.ft. (an increase over last year of 2,074,000 c.ft.), and 8145 tons of coal have been carbonized, giving an average make per ton of 17,877 c.ft., against 17,068 c.ft. last year. During the severe weather of last winter it was necessary to operate the Tully gas plant for a short period, during which time 9,050,000 c.ft. of mixed gas were manufactured.

The quantity of gas sold, as registered by consumers' meters, is 137,528,600 c.ft., an increase of 2,152,500 c.ft., equal to 1·59 p.ct.

Owing to the reduction made in the price of gas of 3d. per 1000 c.ft., with a re-arrangement of the scale of charges for industrial consumers, which operated from March 31, 1928, the receipts for sale of gas are less by £1694.

The total income from residuals is £728 less than last year, tar accounting for £893, while coke shows an increase of £164. The quantity of coke sold was 2777 tons.

During the year, apart from the many miscellaneous services rendered, 1024 orders for apparatus were received, consisting of 324 cookers, 63 fires, 85 wash-boilers, 202 irons, and 359 lighting burners.

Before the coming winter it is hoped to complete the conversion of the existing Tully gas plant to a standard type of carburetted water gas plant of a capacity of 500,000 c.ft. per day.

COKE MANUFACTURE IN CANADA.

A Growing Industry.

Figures set forth in the current issue of the "Board of Trade Journal" indicate that the manufacture of coke is a rapidly growing industry in Canada, due to increased sales and larger smelter requirements. Production in Canada during the three months ended March 31 totalled 650,617 tons, as compared with 533,671 tons reported for the first quarter of 1928, and 506,587 tons produced during the corresponding period of 1927.

Makers of coke reported sales during the first quarter of this year of 316,713 tons, compared with 238,497 tons a year ago, and consumption in associated smelters rose to 303,515 tons from 263,668 tons. Tonnage used in coke plants also rose to 67,396 from 60,088.

Charges to coke ovens during the first quarter of 1929 included 656,771 tons of imported bituminous coal out of a total of 894,175 tons, Canadian mines supplying the balance of 237,404 tons. Canada also imported in the period under review 327,764 tons of coke, which, with the Canadian production of 650,617 tons, made an available supply of 978,381 tons. Allowing for 7172 tons exported, the apparent consumption amounted to 971,209 tons. This figure compares with 760,234 tons in the first quarter of 1928, showing an increase in Canada's coke requirements this year of nearly 28 p.ct. Coke charged to iron blast furnaces during the three months ended March 31 totalled 290,087 tons, as against 234,118 tons charged in the first quarter of 1928, an advance for this year of 24 p.ct.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July 22.*

Business in tar products during the past week has been rather quiet. The price of pitch is unchanged at 42s. 6d. to 45s. per ton f.o.b.

The price of creosote for export continues to be quoted at 6¾d. per gallon f.o.b.

There is no change to report in other products.

Tar Products in the Provinces.

July 22.

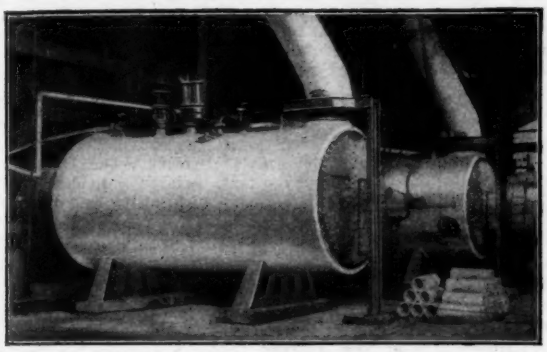
The average prices of gas-works products during the week were: Gas-works tar, 20s. to 25s. Pitch—East Coast, 40s. to 42s. 6d. f.o.b. West Coast—Manchester, 34s. 6d. to 37s.; Liverpool, 36s. 6d. to 39s. 6d.; Clyde, 36s. 6d. to 39s. 6d. Toluole, naked, North, 1s. 7¾d. to 1s. 8½d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 3¾d. to 1s. 4¼d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid and salty, 3¼d. to 3½d.; low gravity, 2d. to 2¼d.; Scotland, 3¼d. to 3½d. Heavy oils, in bulk, North, 5½d. to 6d. Carbolic acid, 60's, 2s. to 2s. 0½d. prompt. Naphthalene, £13 to £15. Salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.	s. d.	
Crude benzole	0 10	to 0 11	per gallon at works
Motor "	1 5	" 1 6	" " "
90 p.ct. "	1 7	" 1 8	" " "
Pure "	1 10	" 1 11	" " "

KIRKE
PATENT WASTE HEAT BOILERS
working on a
WATER GAS PLANT
at
Yokohama



A battery of 3 Kirke Patent Waste Heat Boilers installed for a Japanese client. An excellent example of turning waste into profit.

WHY

have we obtained such satisfactory results for owners of Water Gas Plants?

BECAUSE

there is

1. COMPLETE COMBUSTION
of the "Blow" Gases.

2. NO PRIMING
because the boiler is horizontal.

3. NO LEAKAGE
at inlet tube-plate because scale cannot fall on the inlet tube-plate as in the case of a vertical boiler.

4. SAVING OF SPACE
because the boiler is elevated.

5. TUBES ARE EASILY CLEANED
on both sides.

Write to us for full particulars:

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LIMITED

50-64 BROADWAY, WESTMINSTER, S.W.1.
'Phone: VICTORIA 2802-3.

O. & S.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The market has taken a slightly easier turn as far as prompt coals are concerned. The shortage of boats has again been quite pronounced, and this has, as usual, brought some rather cheaper coals on offer. There has also been less inquiry for the next few months than of late, but this is hardly to be wondered at, considering the large quantities which have been sold up to the end of the year. Collieries are still very firm in their ideas for forward business, but uncertainty as to political and other moves makes business for next year very difficult.

Wear Special gas coals are still full of trade at 17s. 3d. to 17s. 6d., as are bests at 17s. f.o.b. Some of the seconds have, however, been feeling the tonnage position, and they are slightly easier at 15s. 9d. to 16s. 6d. There has been more coking coal on offer than recently, and best qualities have been done at 16s. 9d. to 17s., with other sorts at a few pence less. Best Durham bunkers are still quoted at 17s., with other qualities rather easier at 15s. 9d. to 16s. 3d. Best Northumberland screened steams are quoted at 15s. f.o.b.

The gas coke market is very quiet, but the price holds steadily at 21s. to 21s. 6d. f.o.b. for shipment.

YORKSHIRE AND LANCASHIRE.

A partial check to foreign business has been caused by the decision to reduce the subsidy under the Five Counties Scheme, especially in regard to forward arrangements, exporters declining to pay higher prices—namely 18s. to 18s. 6d. for best hards. The demand for furnace coke is firmer, but prices remain unchanged. There is little alteration in the industrial fuel trade owing to the holiday period. Values remain unaltered—washed trebles, 18s. to 18s. 6d.; doubles, 17s. 6d.; singles, 16s. 6d. per ton f.o.b. Supplies of most classes of fuel seem equal to the demand, except for coking smalls, for which there is greater pressure.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports:

South Yorkshire—Hards, Association, bunkers 19s. 3d. to 19s. 9d., export 18s. to 18s. 6d.; screened gas coal, export 18s. to 18s. 6d.; washed trebles, export 18s. to 18s. 6d.; washed doubles, bunkers 19s. 3d., export 17s. 6d.; washed singles, export 16s. 6d.; washed smalls, bunkers 16s. 3d., export 15s. 6d.; rough slack, bunkers 13s. 6d. to 13s. 9d., export 12s. 6d. to 13s.; smithy peas, export 19s. to 19s. 6d.

West Yorkshire—Hartley's (f.o.b.), bunkers 17s. 6d., export 17s. to 17s. 6d.; screened gas coal, export 18s. to 18s. 6d.; washed trebles, export 17s. 6d. to 18s.; washed doubles, export 16s. 9d.; washed singles, export 16s.; washed smalls, bunkers 15s. 3d., export 14s. 6d.; unwashed trebles, export 17s. to 17s. 6d.; unwashed doubles, export 15s. 6d.; rough slack, bunkers 13s. 6d., export 11s. 6d.; coking smalls, export 12s.

Derbyshire and Nottinghamshire—Top hards, bunkers 19s. 3d. to 19s. 9d., export 17s. 6d. to 18s. 3d.; cobbles, bunkers 18s. 9d. to 19s. 3d., export 16s. 6d. to 17s. 6d.; washed trebles, export 17s. to 17s. 6d.; washed doubles, export 16s. 6d. to 16s. 9d.; washed singles, export 16s. to 16s. 6d.; washed smalls, bunkers 16s., export 14s. 6d.; unwashed doubles, export 16s. to 16s. 6d.; rough slack, bunkers 14s. 3d. to 14s. 9d., export 12s. 6d.

Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, bunkers 17s. to 18s., export 16s. 6d. to 17s.; gas coke, export 19s. 6d. to 21s. 6d.; furnace coke, export 20s. to 21s.; washed steam, Goole (West Yorkshire), bunkers 18s.; Hull (West Yorkshire), bunkers 18s. 6d.; Hull (South Yorkshire), bunkers 18s. 9d., export 17s. 6d.

MIDLANDS.

The trade in house coal is at its lowest ebb. Some stocking is being done, but not enough to stir the surface of the market. Merchants complain that the operation of the control falsifies the economic factors upon which they formerly relied in forecasting the winter values. Some of them say they were badly let down last winter by the erratic action of the Central Collieries Commercial Association in the fixing of output quotas from month to month, and they are not going to expose themselves to such hazards again.

It is not easy to condense what the coalowners of the area think of the suspension and re-introduction of the export subsidy on a limited basis. Judgment is largely coloured by the point of view—and the points of view from which the problem is regarded are many. There are no very evident effects of recent re-arrangements on inland sales. Apart from excess output of large coals at some of the collieries, the market equilibrium is fairly well maintained. Little business has resulted from the offers of increased supplies of gas coal.

Prices are unchanged. Industrial requirements tend to decrease with the holidays acting as a drag on production in many departments of manufacture. The demand for pig iron keeps the coke market tight, but there is no measurable development.

CONTRACTS OPEN.

Waste Heat Boiler.

The Stretford and District Gas Board are inviting tenders for the installation of a waste heat boiler. [See advert. on p. 214.]

The offer of the Gas Light and Coke Company has been accepted by the London County Council to instal in the new houses in the Barking section of Becontree a gas service for heating and cooking, with one gas point for lighting in the room in which the cooker is fixed, subject to payment by the Council of £1 for a gas mantel register to be fixed in the second bedroom.

Parkinson Stove Company, Ltd.

The twenty-third annual report of the Directors of the Parkinson Stove Company for the year ended March 31 shows that, after providing for depreciation of plant and machinery on the usual lines, and for income-tax, the profit for the year, with the amount brought in from the previous year, and after paying the dividend on the preference shares, and interim dividend on the Ordinary shares, is £20,024, out of which the Directors recommend payment of a final dividend on the ordinary share capital of £120,000 of 1s. 3d. per share, free of tax, for the year ended March 31, 1929, also a proportionate dividend at the same rate on the 23,000 ordinary shares issued for cash at par on Jan. 24, 1929, and that there be carried forward to next account £12,265. The basis of the business of the Parkinson Stove Company (Australia), Ltd., has recently been broadened by its acquisition, on very favourable terms, of the whole share capital of an established and successful Australian company specializing in the manufacture of water heating and other domestic appliances. Though, at present, the Parkinson Stove Company, Ltd., hold all the shares in the Parkinson Stove Company (Australia), Ltd., the time may come when it may be desirable to introduce outside capital, in view of which, and in accordance with the sale and purchase agreement, this subsidiary has, since the date of the balance-sheet, allotted to the Company 10,000 £1 fully paid shares in payment of the Company's Australian goodwill. The balance-sheet item, "Amounts due from Subsidiary and Associated Companies," includes the par value of these shares, and a capital reserve account of £10,000 has been created. Having regard to the remarkable growth of the business of the Company since its formation in 1907, the original goodwill figure of £9376 8s. 9d., is now purely a nominal one.

Frew & Stewart have been registered, with a nominal capital of £10,000, to carry on the business of gasfitting and heating engineers. Offices: 6, Mill Street, Perth.

Berwick Gas Profits.—A dividend of 5 p.ct., free of income-tax, was agreed at the annual meeting of the Berwick and Tweedmouth Gaslight Company on July 17. The report stated that the works and plant had been maintained in good order, and the net profit realized amounted to £1685.

Commercial Gas Company's Dividend.—The Directors have declared an interim dividend on the ordinary stock for the half-year to June 30, 1929, at the rate of 5 p.ct. per annum (*less* income-tax), payable on Aug. 15. The dividend is at the same rate as for the corresponding half of 1928.

Birmingham Gas Testing.—Prof. F. W. Burstall, of Birmingham University, in his quarterly report on the gas testing in Birmingham, states that the average calorific value, based on the number of tests as laid down by the Gas Referees, is 477·3 B.Th.U. per c.ft., when reduced to standard conditions of temperature and pressure. The declared value of the gas set up by the Gas Referees to the Birmingham City Council is 475 B.Th.U. per c.ft., when reduced to standard conditions of temperature and pressure. In no single test made throughout the quarter had the gas had such a value as to exceed the limits of variation laid down by the Gas Referees.

Skipton Gas Department Report.—The report presented to Skipton Urban District Council recently showed that the Gas Department made a profit of £3279 on the past year's working, and the Council approved a recommendation of the Gas Committee that £1000 be allocated as the nucleus of a reserve fund. Councillor W. Bellamy, Chairman of the Gas Committee, referred to the efficiency of the undertaking, but added that the largest gasholder was erected in 1888, and it had not hitherto been possible to make a thorough examination of it, and it was now proposed to take this course. During the past nine months the price of Skipton gas was reduced by 6d. per 1000 c.ft.

Street Lamp Fire in Holborn.—A steam wagon collided with a lamp-post in Broad Street, Bloomsbury, on July 19, and the escaping gas caught fire. The accident occurred in the area devastated by the great Holborn explosions in December last, and so vivid were the flames that a considerable portion of the "devastated area" now under repair was illuminated for over an hour. The steam wagon was endeavouring to avoid a motor-car, and the force of the impact not only knocked down the lamp standard, but tore up the pavement of the street refuge on which it stood. Flames immediately burst from the main beneath the roadway and continued for a considerable time after the accident, the efforts of the firemen being watched by a large crowd. The area of the smash was quickly enclosed by police and firemen, only the centre of the roadway being affected. None of the men on the steam wagon was injured. The gas was cut off after about an hour, and the flames quickly died down.

Illingworth Carbonisation Company.—The Directors of this Company, which was formed in June, 1928, to take over the rights for the Illingworth process of low-temperature coal carbonization, have issued a progress report covering the period from October, 1928—when the public issue of capital was made—to July 15. They report that the demonstration plant at Pontypridd is booked for tests for months ahead, and that a great deal of interest is being shown in the process. The plant for Pearson & Dorman Long, Ltd., will be working towards the end of the year, and the installation of that for Pease & Partners at Allerton Main Colliery is proceeding satisfactorily. Contracts for the installation of plant have been secured from Canada, France, Italy, and elsewhere, and the finance required for the operating companies, amounting to £1,000,000, has been settled. At the present moment, it is reported, the cash at call and in the bank amounts to £30,000, and there are outstanding options over 50,000 shares which will be exercised. The financial year of the Company will end on Oct. 31 next.

Parkinson & Cowan, Ltd.

The report of the Directors of the Company for the year ended March 31 states that the total income received and accrued from Subsidiary and Associated Companies has been fully maintained, after leaving therein profits much in excess of temporary losses in three other Subsidiary Companies, two of which have only been recently formed and could not be expected to make profits in the initial period. After paying debenture interest for the year, and providing for depreciation of buildings, the accounts show a balance of net profit for the year of £88,281, to which is added the sum brought forward on April 1, 1928, after paying a final dividend on the ordinary shares for the previous year, and transferring £17,500 to the reserve fund, £27,176, making a total of £115,458. The payment of preference dividend has absorbed (subject to tax) £23,927; and an interim dividend for the six months on the old ordinary shares at the rate of 5 p.ct. per annum on the old issue, and at a like proportionate rate on the instalments paid up per share of the issue of July 10, 1928, has been paid, amounting (subject to tax) to £12,509. The disposable balance is £79,020; and out of this balance the Directors recommend the payment of a final dividend on the old ordinary shares for the year of 7½ p.ct.—making, with the interim dividend, a total dividend for the year of 10 p.ct.—and a like proportionate dividend on the instalments paid up per share of the issue of July 10, 1928 (*less* income-tax). They also recommend that £18,000 be carried to the reserve fund, and that there be carried to next account £28,929. In pursuance of a special resolution passed by the shareholders on Jan. 25 last, and with the sanction of the Board of Trade, the name of the Company was, as from Feb. 11, changed to "Parkinson & Cowan, Ltd."

Gas Light and Coke Company's Dividend.—The Directors of the Gas Light and Coke Company have declared a dividend for the half-year ended June 30, on the ordinary stock, at the rate of £5 12s. p.ct. per annum.

Developments at Sidmouth.—It is suggested that a portion of the profit of nearly £18,000 made by the Sidmouth Urban District Council upon the sale of its electricity undertaking to the Whitehall Securities Corporation, Ltd., shall be applied to the development of the Council's gas undertaking.

Carbonization of New Zealand Coal.—A contract has been entered into between Fuel Industries, Ltd., of London, and four Waikato coal companies for the carbonization of their coal by a new company with a capital of £100,000. A contract has been let for two carbonizing, tar distillation, and briquetting plants capable of treating 50 tons daily.

Three-Mile Gas Pipe at Ballymena.—Negotiations are in progress between the Ballymena Urban Council Gas Department and the Maine Textile Works, Cullybackey, for a supply of gas. Should these be successful, and sanction be given by the Ministry of Home Affairs, pipes will be laid for the three-and-a-half miles between Ballymena and Cullybackey, providing a large amount of employment.

Gas Consumption in the United States.—The following interesting figures relating to gas consumption in the United States appeared in the "Gas Age-Record" for June 22: More than 14 million American homes are now served by gas companies, and of this total approximately 13 millions have gas ranges, according to a survey recently completed by the American Gas Association. It is found that 10,830,000 homes are using manufactured gas, and 3,750,000 natural gas, making gas the most widely used of all domestic fuels. The numbers of homes using the following fuels for cooking are: Gas, 12,970,000; coal and wood, 8,290,000; oil, 6,000,000; and electricity, 590,000.

Darlington Gas Department Report.—The report of the County Borough of Darlington Gas Department for the year ended March 31 last shows that the total amount of gas made during the year was 662,990,000 c.ft., being an increase of 8,358,000 c.ft. over the previous year, while the total sales were 622,486,290 c.ft., or an increase of 8,740,416 c.ft. The amount of coal carbonized was 40,043 tons. The gross profit for the year amounts to £21,200 and the net profit to £8496, being a decrease of £1004 on the year ended March 31, 1928. The number of consumers are 9570 ordinary and 9138 prepayment, making a total of 18,708, which is an increase of 447 during the period under review. The unaccounted-for gas was 4·98 p.ct., as against 5·14 p.ct. for the previous year.

The London County Council have consented, subject to certain conditions, to the affixing by the South Metropolitan Gas Company on the north-east face of the abutment of Deptford Creek Bridge of a notice and tide gauge indicating the position of, and the depth of water over, the Company's 48-in. gas main which crosses the creek.

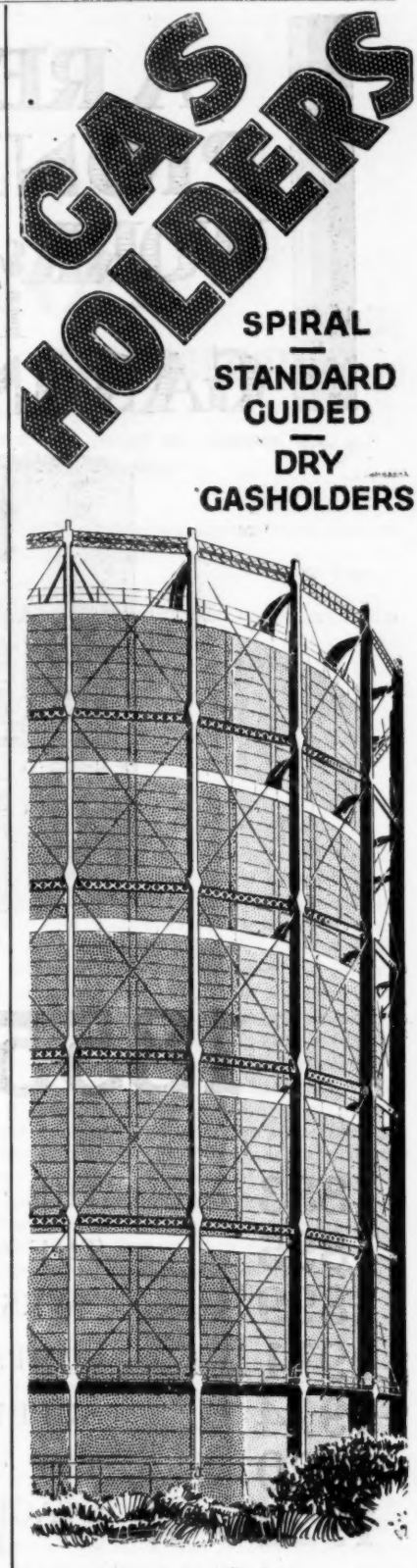
Bees swarmed in the lantern of a Birmingham street lamp in College Street, Spring Hill, on Monday night of last week. It was an automatically-controlled lamp, and it was daylight at the time. The bees destroyed the gas mantle of the lamp; and when, after dusk, the gas should have been lit up at the appointed hour, it did not do so. The lantern part of the lamp became filled with gas, with the result that the bees were overcome and died from gas poisoning. The Corporation Street Lighting Department was informed, and a man was sent to remedy the damage caused by the bees. He scraped out the dead insects, renewed the mantle, and the lamp burned with its accustomed brightness.

STOCK AND SHARE LIST.

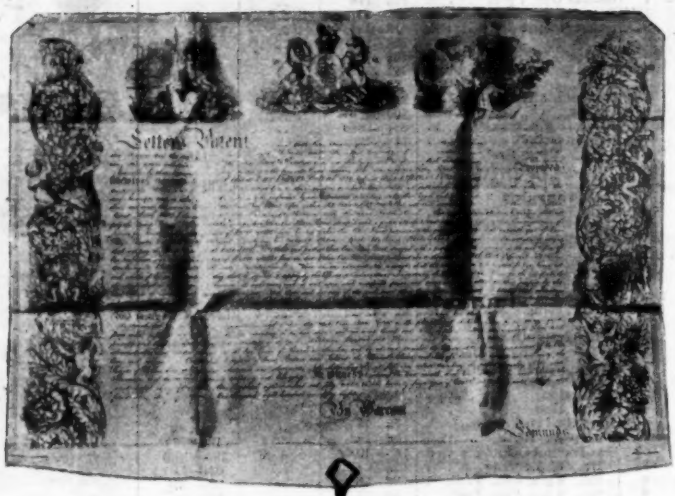
[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. July 19.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Feb 7	5	5	Aldershot 5 p.c. max. C.	70—75	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	73—76	..	76
1,551,868	,,	Apl. 11	7½	7½	Alliance & Dublin Ord.	96—99	..	96—96½
374,000	,,	July 11	4	4	Do. 4 p.c. Deb.	62—65*	..	..
832,655	,,	Mar. 7	7	7	Barnet Ord. 7 p.c.	115—118	..	..
800,000	1	May 9	1/4½	1/4½	Bombay, Ltd.	19/—21/-	..	19/-
172,500	10	Mar. 7	8½	9	Bournemouth 5 p.c.	13—13½	..	..
600,050	10	,,	7	7	Do. B 7 p.c.	12½—12¾	..	..
439,160	10	,,	6	6	Do. Pref. 6 p.c.	10½—11½	..	11½
50,000	Stk.	July 11	3	3	Do. 3 p.c. Deb.	54—57*	..	..
162,925	,,	,,	4	4	Do. 4 p.c. Deb.	72—75*	..	..
357,900	,,	Mar. 21	7½	7½	Brighton & Hove 5 p.c. Con.	113—116	..	..
371,880	,,	,,	6½	6½	Do. 5 p.c. Con.	100—103	..	..
1,287,500	,,	Feb. 21	5	5	Bristol 5 p.c. max.	82½—90½a	..	..
855,000	,,	Apl. 11	8	7½	British Ord.	117—120	..	118—119
100,000	,,	June 27	7	7	Do. 7 p.c. Pref.	112—117	..	115
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	71—74	..	..
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	94—57	..	96½—96½
100,000	10	May 30	6	8	Cape Town, Ltd.	8½—9½	..	9½
100,000	10	Apl. 24	4½	4½	Do. 4½ p.c. Pref.	6½—7½	..	..
150,000	Stk.	June 27	4½	4½	Do. 4½ p.c. Deb.	71—76	..	..
426,880	,,	Feb. 21	6	6	Cardiff Con. Ord.	97—100	..	..
927,840	,,	June 27	7½	7½	Do. 7½ p.c. Red. Deb.	99—102	..	..
167,150	,,	Feb 21	5	6½	Chester 5 p.c. Ord.	88—93b	..	..
98,935	1	May 9	†2/-	†2/-	Colombo Ltd. Ord.	35/—37/-	..	..
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	20/—22/-	..	..
275,402	1	Apl. 11	1/9½	1/9½	Colonial Gas Assn. Ld. Ord.	24/6—26/6	..	..
187,848	1	,,	1/7½	1/7½	Do. 6 p.c. Pref.	20/6—22/6	..	..
2,073,280	Stk.	Feb. 21	5	7	Commercial Ord.	97—100	..	97½—99
475,000	,,	June 13	8	8	Do 8 p.c. Deb.	56—59	..	..
187,560	,,	Feb. 21	7	7	Croydon sliding scale	111—114	..	..
403,100	,,	,,	5	5	Do. max. div.	83—86	..	..
542,270	,,	Mar. 7	7	10	Derby Con.	112—117e	..	..
55,000	,,	June 27	4	4	Do. Deb.	68—71e	..	..
200,000	,,	Mar. 7	5	5	East Hull Ord. 5 p.c.	73—75	..	..
1,002,180	10	Mar. 21	†4	†7	European, Ltd.	16—18	..	16½—17½
16,703,480	Stk.	Feb. 21	5½	5½	Gas Light & Coke 4 p.c. Ord.	19/—19/6f	+-/3	19/—19/6
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max.	62½—64½	..	63½—64
4,187,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	76—78	..	76½—77½
5,602,630	,,	June 13	8	8	Do. 8 p.c. Con. Deb.	58—61	..	58½—59
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	97—100	..	99—99½
82,500	,,	Mar. 21	7	7	Hastings & St L. 5 p.c. Conv	98—103	..	..
259,740	,,	,,	5½	5½	Do. 5½ p.c. Conv.	80—85	..	..
70,000	10	Apl. 24	†10	†10	Hongkong & China, Ltd.	14—15	..	14½—14¾
213,200	Stk.	Mar. 7	5½	6	Hornsey Con. 5½ p.c.	86—89	..	87—88
1,978,000	,,	May 30	10	20	Imperial Continental Cap.	375—395	—5	375—388
228,180	,,	Feb. 7	8½	8½	Do. 8½ p.c. Red. Deb.	70—73	..	72
235,242	,,	Mar. 7	7½	8	Lea Bridge 5 p.c. Ord.	117—120	..	..
2,145,907	,,	Feb. 21	6½	6½	Liverpool 5 p.c. Ord.	95—96b	..	..
600,000	,,	Mar 21	7	7	Do. 7 p.c. Red. Pref.	104—106b	..	..
185,756	,,	Feb. 21	9	8	Maidstone 5 p.c. Cap.	124—129	..	..
63,480	,,	June 27	3	3	Do. 3 p.c. Deb.	53—56	..	..
75,000	5	June 13	†8	†10	Malta & Mediterranean	5½—6	..	..
392,000	—	Apl. 2	—	5½	Metrop't'n (of Melbourne) 5½ p.c. Red. Deb.	100—102	..	..
641,920	Stk.	May 30	†5	†9	Montevideo, Ltd.	105—108	..	..
2,081,815	,,	Feb. 21	5	5½	Newcastle & Gateshead Con.	17/—17/6d/	..	..
682,856	,,	,,	4	4	Do. 4 p.c. Pref.	72½—73½d	..	..
491,705	,,	June 27	5½	5½	Do. 5½ p.c. Deb.	68—69d	..	..
131,780	,,	Mar. 7	7/1/0	7/1/0	North Middlesex 5 p.c. Con.	105—110	..	..
800,000	,,	Apl. 24	9	7	Oriental, Ltd.	115—120	..	118—119½
205,162	,,	June 27	8	8	Plym'th & Ston'house 5 p.c.	110—113	..	112—113
424,416	,,	Feb. 21	7½	8½	Portsm'th Con. Stk. 4p.c. Std.	113—118	..	115—116
241,446	,,	,,	5	5	Do. 5 p.c. max.	82—85	..	83—83½
2,334,464	1	June 27	—	†5	Primitiva Ord.	36/—38/-	..	36/—37/6
244,500	100	June 8	4	4	Do. 4 p.c. Red. Deb.	92—95	..	..
695,000	Stk.	Jan. 24	4	4	Do. 4 p.c. Red. Deb. 1911	79—82	..	..
416,345	,,	June 27	4	4	Do. 4 p.c. Cons. Deb.	78—81	..	80
150,000	10	Mar. 21	6	6	San Paulo 6 p.c. Pref.	8½—9	..	..
1,736,968	Stk.	Mar. 21	6½	6½	Sheffield Cons.	108—110e	..	..
95,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	74—77e	..	..
90,000	10	June 13	‡4	‡4	South African	4—6	..	..
6,509,895	Stk.	Feb. 21	5	7½	South Met. Ord.	104—106	..	103½—104½
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	108—111	..	109—110
1,895,445	,,	July 11	8	8	Do. 8 p.c. Deb.	57—60*	..	57½—58½
724,000	,,	Mar. 7	6½	6½	Do. 6½ p.c. Red. Db.	100—102	..	..
91,500	,,	Mar. 7	8½	8½	South Shields Con.	106½—107½d	..	..
1,543,795	,,	Feb. 21	6½	6½	South Suburban Ord. 5 p.c.	107—110	..	..
468,837	,,	June 27	5	5	Do. 5 p.c. Deb.	95—98	..	..
847,740	,,	Mar. 7	5	5	South'mpton Ord. 5 p.c. max.	77—80	..	79
191,275	,,	June 27	4	4	Do. 4 p.c. Deb.	70—73	..	..
179,014	,,	Feb 21	8	8	Sutton Ord.	116—119	..	..
250,000	,,	Feb. 21	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
200,000	,,	June 27	6½	6½	Do. 6½ p.c. Red. Deb.	100—103	..	..
1,002,275	,,	Mar. 7	—	6½	Tottenham District Ord.	106—109	..	107—108
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
181,255	,,	June 13	4	4	Do. 4 p.c. Deb.	74—77	..	75½
289,094	,,	Mar. 7	6⅞	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	93—98	..	..
68,880	,,	,,	5	5	Do. 5 p.c. pref.	88—93	..	..
80,000	,,	July 11	9	9	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	144—147*	..	..
356,636	,,	,,	7½	7½	Do. B 5½ p.c.	122—127*	..	..
432,585	,,	,,	6 3/10	6 3/10	Do. C and New	100—105*	..	..
252,000	,,	,,	7½	7½	Do. Wimbledon 5 p.c.	112—117*	..	..
98,000	,,	,,	7⅝	7⅝	Do. Epsom 5 p.c.	123—128*	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref	87—92*	..	..
88,416	,,	June 27	3	3	Do. 3 p.c. Deb.	54—57	..	..
184,743	,,	,,	4	4	Do. 4 p.c. Deb.	74—77	..	..
207,500	,,	,,	5	5	Do. 5 p.c. Deb.	93—96	..	..

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. ‡ For year.



A RECORD of PIONEERING WORK & PROGRESS in the GAS INDUSTRY



1855

Patent granted to William Cartwright Holmes, the Founder of the firm of W. C. Holmes and Company, Ltd.

1883 THE "BRUSH" WASHER first patented.

1895 THE "NEW" BRUSH WASHER introduced.

1899 "WESTERN" GAS VALVES first introduced.

1911 CONTINUOUS TAR DISTILLATION.

1914 SUPER TYPE, HORIZONTAL TUBE CONDENSERS.

1920 THE "1920" PATENT BRUSH WASHER.

1922 STAGE WASHING for COMPLETE NAPHTHALENE REMOVAL perfected.

1926 CONNERSVILLE POSITIVE "DRY" STATION METERS, Exhausters and Boosters introduced.

1927 THE "DRI-GAS" PROCESS for removal of water vapour before distribution.

W. C. HOLMES & CO., LTD.,
HUDDERSFIELD - ENGLAND.